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FIFTEENTH YEAR.

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—BY—

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IT is always an interesting study to compare the mechanical qualities of different nations. Essential deficiencies and excellencies alike may in part be traced to origin of race, or blending of races, and for the rest to the circumstantial conditions under which labor is carried on. In an address delivered at Saltaire, Yorkshire, England, by Mr. Mark Pattison, a well known English manufacturer, he had the boldness to point out why the English skilled workman is inferior, on the one hand, to the American, and on the other to the French artisan. As to the United States, he attributed as one cause the drainage of vigor and capacity which took place through the emigration to America in the first half of the seventeenth century, mentioning, in illustration the curious fact that the great mass of colonists were natives of middle and southern England, and that, although a considerable contingent was furnished by what were once Danish settlements in East Anglia and the "Five Boroughs," very few, indeed, came from Yorkshire and Lancashire, the present centers of British industry. He considered that this Puritan exodus meant a loss of blood and brain to southern England comparable with that experienced by France through Huguenot expatriation after the revokation of thd Edict of Nantes. No doubt this country received a good stock in brains and physique, but a far greater number of the same class of men were left behind, and, after all, England had sturdier limbs in the men of Yorkshire, and more intelligence in those of Lancashire. The progress of this country, certainly its elevation to the first national rank in mechanics, is due not only to the descendants of those colonists, but to the vast immigration that has set in, to the influences favoring both the growth of capital and industrial extension, and more particularly to wise legislation which has freed labor from the fetters it wore in Europe. Owing to the comparative scarcity of skilled labor in this country, a strong stimulus was applied to the originating power resulting in labor-saving machines. Our inventors have struck out from first principles, securing novel arrangements of motion, and the ready appreciation and rich rewards that have attended their efforts, have constituted an additional and ever increasing stimulus. The colonial epoch was never favorable to mechanical development. Stringent laws were passed to prevent models and drafts of English machinery being exported to this country. For a time, all new discoveries in practical science and improvements in engineering and machinery were made in England; now it is in this country that the majority of new inventions find birth. English capital can with difficulty be invoked to carry out new devices; here it is the handmaid of invention, and looks to the mechanical field for rich remunerative returns. Of the French it may be said that, in the manufacture of machine tools, they do not seem to have grasped the leading principles of mechanics with sufficient thoroughness and insight to be capable of originating new forms and combinations.

AN important improvement has to be recorded in the manufacture of Siemens Martin steel. Ordinarily in the Siemens-Martin and other processes a bath of cast iron is raised to a very high temperature in a regenerative or other suitable furnace, and being treated usually with additions of iron scrap and oxide, is brought to a steely condition, in which state the molten metal is run out of the furnace and is received into molds to form ingots. Mr. I. A. Huggett, of Kensington, England, has discovered that this process can be worked more advantageously than heretofore by employing steam to blow the metal while it is contained molten in the furnace. He introduces the steam by means of a small iron pipe, connected with a steam boiler by a flexible connection. The end of this pipe he immerses for some inches beneath the surface of the metal, and in an inclined direction, so that the steam issuing from the pipe may mechanically promote circulation at the same time that, by its chemical action, it causes a rapid rise of temperature. The advantages which he obtains are a great saving in the amount of time required to bring the metal bath to the state and temperature suitable for running the metal out of the furnace into the ingot molds, a more complete separation of the sulphur and silicon than can otherwise be conveniently obtained, and the removal of the silicon when desired at an earlier stage than it otherwise would be, so leaving the steel with a high proportion of carbon, while the separation of the silicon has already been effectually obtained. In order to obtain sound ingots he causes the metal to enter the mold at the bottom, and he closes the top of the ingot mold with a loosely fitting cast-iron stopper. Through the stopper there is a small hole. Instantly when the mold has become full of metal, and when the metal is close up, but not in contact with the under side of the plug, he admits a stream of water through the hole in the plug directly on to the top of the molten metal in the mold. He allows the water to run until the ingot is set.

THE latest and most important improvement for securing strength in boilers is unquestionably the introduction of weldless ring joints. Our allusion to them lately has excited much inquiry, and we proceed to describe the process of manufacture, or rather the mechanical means by which they are produced. The weldless rings are turned out from two feet diameter up to fourteen feet, and two feet wide. In increasing the strength of boilers they will necessarily minimise the chances of explosion. The longitudinal seams in boilers have always been a source of weakness. An enormous accession of strength must necessarily be obtained by constructing the shell of the boiler of entire metal rings connected together. These rings are formed by a rolling operation from an ingot of steel, or from a bloom or mass of metal in a similar manner as in rolling railway tires, the ring being formed without a joint, seam or weld. In the rolling mill, which has been specially designed for this work, a fixed and a movable roller, adapted to roll the required rings, are employed. The axles of these rollers are provided with top bearings, and to enable the ingot ring or mass of metal to be placed in position, and the rolled ring to be removed, the upper bearing of the movable roller is arranged to be withdrawn. This bearing is fixed on the outer end of a lever or lever-frame, which is hinged to a sliding standard or carriage, connected with the carriage which carries the movable roller, the sliding standard being actuated by means of hydraulic cylinders. Vibrating frames are also employed, each carrying two, three, or more rollers in place of one, the upper ends of the studs and shafts being stayed. A number of the carrying rollers are connected, by means of bevel or suitable gearing, with revolving shafts, so that they assist in the carrying round of the ring. In carrying out this method of rolling, a hole is punched in the ingot or bloom, and a mandrel introduced. The mass of metal with the mandrel in position is then placed under a steam hammer on a swage, which is formed to confine the metal sideways, so as to produce an extension of the length under the blows of the hammer until a rough cylinder of sufficient length is obtained, but in some cases the ingot is cast in the form of a hollow cylinder, which, when necessary, is elongated in the manner above indicated. The ring plates can be produced in any required shape, and with flanged or thickened edges if necessary.

WE would call attention to the main points of a new riveting machine invented by Messrs. DeBergue & Co., Manchester, England, as likely to be suggestive to our own machinists. This machine is designed to work up to a pressure of 70 tons. The supporting pillar, instead of being firmly fixed to the frame, passes through a planed gap, and extending downward is pivoted at the foot. It is held in an upright position by two strong tension bolts, which are drawn tight by the action of water in a hydraulic cylinder at the back of the machine. This cylinder is in direct communication with a smaller cylinder, closed at its upper end, and loaded with dead weights like an ordinary accumulator. To prepare the machine for working, a screwed plug is removed from the top of the weighted cylinder, and water is poured in until both cylinders are quite full, and with a few strokes of a small hand pump raising the weighted cylinder a few inches, the pressure is put on. This pressure is common to both cylinders, and is determined by the load upon the vertical cylinder, which can be regulated at will. Whatever weight is used, the resulting pressure on the head of the rivet can be absolutely relied on as constant and unvariable, and no renewal of water or further attention is required after the apparatus is once charged. When the heading ram presses the head home the holding up pillar yields, and the arrangement dispenses with all valves and pumps, while it is claimed that in the place of a momentary crushing blow, which is given by a weighted accumulator falling through a considerable space, in the new machine the force exerted is a slow, steady squeeze, with a pressure which can be varied as required.

ONE signal benefit that would be derived from the use of electricity on our railways as a motor power would be the lightening of engines and the avoidance of the cost of making bridges so heavy. It is not possible with steam to make the locomotive much lighter, for it would not then have sufficient adhesion to the rails to be able to draw the train, but the employment of electricity enables the train to be driven with every pair of its own wheels, just as the employment of compressed air enabled every pair of wheels to brake the train. One reason why electric transmission of power can be effected with so little waste is because electricity possesses apparently no mass, and conse-

quently no inertia; there is, therefore, no waste of power in making a train driven by it ascend a heavy grade, as with water or any other kind of material fluid. Experiments show that one horse power can be developed per 50lb. of dead weight of the electro-motor, a result immensely more favorable than can be obtained with steam, gas or compressed air engines. The simplest plan for electric railways is to use the two rails as the two wires, and make connexion with the motor through the wheels of the train; those on one side being well insulated from those of the other; otherwise the current would pass through the axles of the wheels instead of through the motor. The simple plan is that employed in Siemen's Lichterfelde electric railway, now running at Berlin; the insulation arising from the rails being merely laid on wooden sleepers having been found sufficient for the short length, 1½ miles. There has been devised in England a method for overcoming leakage of electricity from various causes, among which is moist ground. Instead of supplying electricity to one very long, not very well insulated rail, there would be laid by the side of their railway line a well insulated cable to convey the main current. The rail, which is rubbed by the moving train, and which supplies it with electric energy, is to be subdivided into a number of sections each fairly well insulated from its neighbor and from the ground, and so arranged that at any moment only that section or sections in the immediate neighborhood of the train would be connected with the main cable; the connexion being, of course, made automatically with the moving train. As then leakage to the earth of the strong propelling electric current could only take place from that section or sections of the rail in the immediate neighborhood of the train, the loss of power by leakage is very much less than in the case of a single imperfectly insulated rail, such as has been hitherto employed, and which, being of great length, with its correspondingly large number of points of support, offers endless points of escape to the motive current. Thus what we may term electric mechanism is being gradually perfected.

THE falling off in the demand for locomotives, extending even to the countermanding of orders given, necessarily excites considerable comment in business circles. This state of affairs is confirmatory of views we previously expressed, that railway "enterprise," so called, was in many quarters being pushed too far. It is the purely stock-jobbing railways—railways that are not likely to pay the original investors—that are the first to feel the reaction from the late inflation of securities. The fact would seem to be not that the locomotives that have been ordered are not wanted, but that locomotive manufacturers themselves are not willing to extend that amount of credit to certain companies which they formerly granted. Not a few of the locomotive works that have received good orders from leading companies, which they declined to fill inside of a year, will, through their release from other contracts, be enabled to fill them in a few months. Machine shops generally throughout the country show no slackening of activity.

IT appears that it is difficult to obtain good steel for magnets, and we would direct the attention of steel manufacturers to the opening thus offered for the production of a suitable steel for magnetic storage and transmission, a prime condition being that it shall be uniform in this power. The superior power of the Gower-Bell Telephone is, in fact, largely due to the use of French cast steel manufactured by M. M. Charrie & Co. If good steel is used, it is found that the mode of magnetizing is a matter of minor importance. The excellent magnetic properties of French steel are said to be due to the presence of about 3 per cent. of tungsten.

PHILOSOPHERS are getting bold with figures and with theories, and apparently for the reason that no one can decisively contradict them with their astounding assertions. Dr. Siemens' estimates that the ruler of the solar system would consume the total output of coal over the whole world--an output which is little short of 300,000,000 tons annually—in the one-forty millionth part of a second. Accept this proposition, and then comes the question: Why does not the sun with such devouring powers burn itself up? Dr. Siemens is not the man to profess ignorance on anything under or in the sun, so he alleges that the whole space through which the sun travels in its daily journey is filled with gaseous matters, which are being daily drawn into the vortex of flame, and thus perpetually feeding it. In other words, the "great source of unexhausted light" as he rushes through his daily journey of nearly 700,000 miles, gathers up his daily food as the bee or the husbandman who goes forth in the morning. Dr. Siemens provides lots of argument in support of his theory, which is characterized as "beautiful," but is it the true one?

THE House Committee on Patents, which some time ago agreed upon a bill to protect innocent purchasers of patent rights, have reconsidered their previous action, and resolved to report an entirely new bill, which provides that no action for damages or proceedings in equity shall be sustained, nor the party held liable under sections 4919 or 4021 of the Revised Statutes of the United States for the use of any patented article or device when it shall appear on the trial that the defendant in such action or proceeding purchased said article for a valuable consideration in the open market.

MANUFACTURES.

TO MACHINISTS, MANUFACTURERS AND OTHERS.

THE publishers of THE TRADE REVIEW solicit items of information concerning manufacturing and other establishments in any part of the country, and all such items will be promptly inserted in these columns, free of charge. Facts are the only things needed; and all communications should be accompanied with the name of the contributor—not for publication—but as a guarantee of good faith.

Manufacturers, machinist and engineers are particularly requested to communicate any matters of interest relating to their specialties. No one need be deterred from sending any interesting facts in his own language, as all such contributions will be properly revised befor sendin to press.

OHIO INDUSTRIES.

THE Canton Car Co. expect to turn out 10 cars per day.

THE shops of the Bee Line Railroad at Delaware are to be enlarged.

THE Youngstown Car Works will probably be enlarged this season.

T. J. SANTOM & SON, South Akron, have enlarged their carriage and wagon works.

THE new carriage factory at Norwalk commenced operations on Monday last.

THE pail factory of Udall & Co., Garrettsville, was destroyed by fire last Monday night.

THE Bartlett Iron and Steel Works, capital stock $500,000, will be located at Vermillion.

THE Purdy Machine Co., Cleveland, are making machinery for a chair manufactory in Louisiana.

THE buildings for the Akron-portage Straw-Board Co.'s works will cover over one acre of ground.

THE Rigby Car Wheel Company, of Cleveland has been incorporated with a capital stock of $500,000.

THE Cincinnati Electric Company has been organized, with a capital stock of $100,000; also the Wellington Fertilizer Co., with a capital stock of $30,000.

THE rolling mill at Columbus is filling a contract for 6,000 tons of steel rails.

THREE double furnaces are being erected in the new spike factory at Brown, Bonnell & Co.'s mills, Youngstown.

TAPLIN, RICE & Co., Akron, have increased their working capital to $100,000, and added to the number of their hands.

THE Youngstown Car Works have just completed 300 cars of the most approved patterns for the Pittsburgh & McKeesport extension of the Pittsburgh & Lake Erie road.

WE have received the new catalogue of Russell & Co., Massillon, the fortieth issued, replete with illustrations of their celebrated agricultural machines, saw mills and portable engines.

THE manufacture of boots and shoes in Cincinnati this year is expected to amount to $7,000,000 in value. It is stated that $2,000,000 additional capital could be advantageously employed there in this line.

THE Akron Sewer Pipe Co. is constructing a new down-draft kiln 15x30 feet in dimensions. Two large new brick smoke stacks will also be built this spring. The shop is doing a very heavy business. —*Beacon.*

THE Akron Strawboard Co. has introduced into their works a combination gas machine of 80-light capacity, for illuminating the various departments of the shop. The foundation for a new warehouse is being constructed.

THE Ohio Institute of Mining Engineers will meet at Nelsonville, Athens county, at the Dew House, on Thursday evening, May 11th, at 7:30 P. M. The proceedings will be of an important character, and papers submitted by eminent engineers will be discussed.

THE addition to the paper mill of George H. Friend & Son, West Carrollton, is intended for two machines. A 250 horse-power Buckeye engine is to be added to supplant the water power. Four 1,500-pound rag engines are to be added, besides several improvements in the original mill.

THE Dayton Screw Co., Dayton, is now fully organized, with Mr Albert G. Angell as president, and Mr. Samuel L. Worsley superintendent. New machinery of an improved character is being introduced, and the works, which have been idle for several years, will shortly be in operation.

THE Tricycle Manufacturing Co., at Springfield, are preparing to place some new and very attractive goods upon the market this season, among which we may mention their children's tricycles and wheelbarrows, also farm and railroad barrows of superior quality of workmanship and material.

A CONCERN at New Philadelphia manufactures a machine which dispenses with the method of driving in the axle-boxes of carriages and wagons by means of sledges, substituting a screw which affords sufficient pressure to force the boxes into the wheel without the danger of bruising or breaking them, and fitting them much tighter.

JOHN M. STULL will build a factory in Warren 24x100 feet in size, to be used by Messrs. Matthews & Hescock as a galvanized iron works. They will employ 15 men, and the rent of the building two years, $400, has been subscribed for by business men of Warren.—The card rate on nails remains the same.

THE new furnace and nail works at Ironton is an assured success. The capital stock is to be $300,000. It is proposed to put the works on the present ground of Grant furnace, which the proprietors offer to the new company for $25,000. There are six or seven acres of land in the tract. The idea is to erect a 40 ton stone coal furnace and a machine nail mill.

MESSRS. MORGAN, WILLIAMS & Co, engineers, Alliance, have in operation this year one of the largest planers ever constructed. It is capable of planing a piece of iron or other metal 10 feet wide, 10 feet high and 24 feet long, and so arranged that four cutting tools may operate on the work at one time—two of these are on the cross-head, and one on each upright. The bed-plate is a massive casting, 6 feet wide and nearly 40 feet long, weighing nearly 40,000 pounds; each upright weighs about 10,000 pounds, and the total weight of the tool is 120,000 pounds.

A STOVE company has been organized by Wooster capitalists, and has been incorporated with a capital stock of $25,000. The foundry of Stevens & Co., has been leased for a number of years and will be fitted up by the company for the manufacture of all kinds of stoves. They expect to have the establishment in full operation within the next two months.

THE business of the Lechner Mining-Machine Co., Columbus, is gradually increasing. They are manufacturing chains of very superior quality, for use in place of leather belting, and have some good orders, which they are filling as rapidly as possible. Their mining machine is looked upon as a very valuable invention, and they expect large orders for it this year.

MESSRS. JOHN H. MCGOWAN MANUFACTURING Co., Cincinnati, have just filled several large orders for tobacco machines, shipped to several points West and South, and to Australia. Their works are running to their full capacity upon tobacco machines and "Rival" pumps of various sizes. The business of this company has more than doubled in the past 12 months, and a very heavy business is expected this year.

MR. CHARLES GOOCH, manufacturer of ice-cream freezers, Cincinnati, has just returned from a business trip, and brings with him some large orders for his goods. He is turning out from 350 to 400 freezers per day, and expects this season to largely increase these figures. He is shipping to all parts of the United States and Canada. His castings are made at the works of Messrs. Sohn & Reutschler, Hamilton.

ON the 1st of June the Cleveland Rolling Mill Co. expects to have completed and ready for blowing in the largest iron furnace in the world, the capacity of which will be 200 tons per day. Immediately after it is completed another furnace of the same proportion will be begun, and work upon it will be pushed forward as rapidly as possible. The two new furnaces, when completed, will employ 250 men, and consume 400 tons of coke daily.

A PORTION of the new land opened upon the Case estate, Cleveland, comprising the tract lying between Case and Willson-avenues, the lake and St. Clair street, in all 120 acres, has been purchased by the Ohio Steel Barb Fence Co., the Cleveland City Forge, the Cummer Engine Co., and the newly incorporated Sewing Machine Co., to be utilized for their manufacturing operations, which already employ nearly 2,000 hands.

THE Western Lock Works, Geneva, a firm employing 200 hands, and supposed to be immensely wealthy, has sold out to Eastern parties at very low figures. It turns out that the officers of the company have been paying from 12 to 20 per cent. dividends to the stockholders for years on borrowed money, and that while the stockholders had supposed their stock was at par, at least, it was in reality not worth over 45 cents on the dollar. The revelations have produced a great sensation. The new company will increase the working force to 300 men.

THE Youngstown Malleable Iron Co., Youngstown, which commenced operations last September, is realizing an excellent business, a steady and increasing demand setting in for their refined malleable iron castings. The Company are also manufacturers of Lambert's malleable iron felloes and the irons for Oviatt's common sense wagon seat riser and lock. The capital of the Company is $40,000. There are forty men employed at the works which are running full time. The officials of the Company are: Henry Tod, President, Paul Wick, Vice President, and J. B. Van Doren, Secretary and Treasurer.

MAST, FOOS & Co., Springfield, are very busy, and are about building an extension of 100 feet to their already large foundry. They are melting now 8 to 10 tons of iron per day; this amount will be more than doubled when the new addition is completed. They have recently shipped, to fill a large order for turbine water wheels, iron turbine wind engines and Buckeye force pumps, from Adelaide, South Australia, and are at this time preparing to fill a large order for same kinds of goods for Christ Church, New Zealand. Their trade in Europe and other foreign ports is rapidly increasing. The business of this company has doubled in the past year, and larger extension of capacity of their works is anticipated in the near future.

THE American Revolving Screw and Bolt Case Co., Dayton, are enlarging their business rapidly. They are making several sizes of the cases, suitable for retail trade or for machinists' use. The base or lower tiers of drawers are made large enough for 6 to 10 inch bolts, and the upper tiers are suitable for all sizes of screws. The case is octagonal, or otherwise, and sits perpendicularly, revolving on a strong pivot. The drawers are arranged around the body of the cylinder. The face or front of each drawer is numbered for certain sizes of screws. For retailers of hardware they are very convenient, as all the numbers are brought in sight by turning the case upon its pivot.

THE Queen City Malleable Iron Co., of Cincinnati, are manufacturing wheels for warehouse and railroad trucks, wheel-barrows, blast-furnace buggies, and other similar purposes. The wheels range in size from 10 inches in diameter, with 3-inch hubs, up to 36 inches in diameter, with 5½-inch hubs. The hubs themselves are hardened upon bearing surfaces, and when a hub is worn out it can be replaced by a new one without the necessity of discarding the wheel. It is claimed by the manufacturers that these wheels are more durable than like articles of wrought iron. In addition to the standard sizes which we have mentioned, the company makes to order wheels of any desired size and pattern. The wheels are very light, and in that respect seem to possess advantages over those ordinarily used for the purpose.

PENNSYLVANIA.

THE Pennsylvania Steel Co., Steelton, employ 2,200 hands, with a monthly product of 11,000 tons steel rails, 1,000 tons steel billets, 250 tons switches, and 600 to 800 frogs. They are building two Siemen's melting furnaces, capacity 20 tons per heat, two blast furnaces 20 foot bosh, shop 80x400 feet for frog department, merchant mill with two trains of rolls.

THE rolling mill which Messrs. Long & Co., of the Vulcan Forge and Iron Works, are erecting at Chartiers Station, on the Pittsburgh & Lake Erie Railroad, will contain 14 puddling furnaces and 2 scrap furnaces, with a rolling department capable of turning out all kinds of merchant iron.

IT is probable that Washington, Washington county, will not get her rolling mill. She failed to come to time, and her neighbor, Canonsburg, having come to the front with a $50,000 offer, the mill will probably be built there.

THE new axe works of Hubbard, Bakewell & Co. on the Allegheny river, Pittsburgh, is nearly completed. There are three frame buildings, the main one, the forge department, being 300x50 feet, the boiler and engine house 228x50, and the grinding and polishing room 348x46 feet.

A NEW blast furnace is to be built at Manchester, Allegheny City, on the site where the old one is now standing, and which has not been in use since the Isabella furnaces at Sharpsburg were lighted, ten years ago. Parties who are said to be at the head of the new enterprise say that work will be commenced at once. The new furnace will be 70 feet high and 16 feet in diameter; four cast-iron hot blast ovens will be built; also three new engines. The stock and casting houses are to be built from a part of the Centennial Building.

A CHARTER has been granted to the Taylor Manufacturing Co., of Chambersburg, with a capital of $150,000. The company, among other things, propose the manufacture of locomotives.

INDIANA.

THE erection of a very complete machine shop, with a heavy steam hammer, will increase the force of hands employed by the Bass Foundry and Machine Co., at Fort Wayne, to 800 men.

THE new foundry (60x80) built by Sinker, Davis & Co., Indianapolis, is full of work, as is the care of every department of this extensive manufactory; 200 hands are now employed.

A NEW foundry is just completed at Huntington by Cook & Spickler, adapted to the general uses of such shops.

THE Indianapolis Rolling Mill Co., Indianapolis, have just completed an extensive foundry.

THE Indianapolis Car Works, Indianapolis, now employ 592 men and are turning out 12 freight cars and 108 car-wheels a day. The shops have turned out 1,195 cars since they were opened last July, and have orders on hand for a large number.

NEW YORK.

THE Claff & Jones Manufacturing Co., of Hudson, have just completed a large pump for the Terre Haute (Ind.) water works, and have commenced a 3,000,000-gallon pump for Decatur, Ill.; also an additional pump for Lafayette, Ind. They have in process of erection two double pumps for the new harbor boat for New York City, which are guaranteed to be able to throw six 2-inch streams 400 feet.

W. & L. E. GURLEY, Troy, manufacturers of mathematical instruments, report an increasing demand for solar instruments for mining purposes over railroad orders, and are adding tools which will give them an increase of 50 per cent. over last year's production.

Two thousand seven hundred tons of puddled iron were turned out at the Albany & Rensselaer Iron Works at Troy, in March, said to be the largest product on record.

Our correspondent at Jamestown writes: The axe and tool works of Mr. C. L. Jeffords, which were established in 1834 and have attained a national reputation, were never in greater activity. Together with axes, picks, mattocks and grub hoes, for the season's work, are in especial demand. Mr. Jeffords prides himself on the quality of his productions, but praise must also be accorded to the forms of his tools and implements which are the best suited to their various purposes. His prospects for the spring and summer months are all that could be desired. Mr. Jeffords employs 50 hands.

CONNECTICUT.

THE Yale Clock Co., New Haven, have got out a beautiful miniature pendulum clock in bronze case, and are making marine clocks and movements for chronometers. They have recently sent 500 clocks to Shanghai, China., and have orders for 1,000 each from Tsin-Tsin and Hong Kong.

THE Southington Cutlery Co. has begun the manufacture of razors.

THE Plume & Atwood Manufacturing Co. have added a pin manufactory to their brass works at Waterbury, and are turning out 200 cases of pins per month.

ILLINOIS.

THE Vulcan Iron Works, Chicago, have just received orders for three of their Skinner's patent steam pile hammers, and also for a car pile driver complete, for the Atchison, Topeka & Santa Fe Railroad.

THE Northwestern Screw Co.'s works, in Chicago, are illuminated by the Fuller electric light, and will now be run double turn.

THE manufacture of steel rails at the North Chicago Rolling Mill Co.'s works, at South Chicago, will commence about May 20. Three furnaces are already in operation, turning out between 400 and 500 tons of pig iron daily, and the company's old works in North Chicago are turning out 2,000 steel rails per week. The capacity of the new works, when completed, will be 3,000 steel rails per week.—*Industrial World.*

THE Stover Manufacturing Co., Freeport, have doubled their capacity in order to supply the demand for their barb wire machines and other specialties.

MISSOURI.

THE Missouri Wire Fence Co., of St. Louis, is a newly incorporated company with a capital of $50,000.

THE Excelsior Manufacturing Co., of St. Louis, will enlarge their molding department by the addition of six floors.

THE Laclede Gas Works Co. will put in at an early date six new generating furnaces. These furnaces are a late invention and are used in only a few of the large Eastern cities. These works have 640 hands.

JAYNES & Co., St. Louis, are erecting machinery for the manufacturing of staves and headings.

The new works of the Whitman Agricultural Co. are running full in all departments. Shipments of horse-powers have been made to Vera Cruz, Mexico, and other large shipments to California and elsewhere. Orders are already being rapidly entered for cider mill machinery.

VERMONT.

THE new sewing machine enterprise at Brattleboro has begun business.

MASSACHUSETTS.

The Chamberlain Manufacturing Co., of Springfield, has been incorporated, with a capital of $30,000, for the manufacture and sale of gas and steam fixtures.

THE Curtis Regulator Co., of Boston, have recently received an order for 175 pressure regulators from the New York Steam Co.

NEW HAMPSHIRE.

THE new foundry just completed for Critchley & Whalley, Portsmouth, is 65x30 feet, and furnishes a long-needed addition to the facilities of this company. This is the first foundry put in operation in Portsmouth for many years.

PENNSYLVANIA INDUSTRIES.

[FROM OUR SPECIAL CORRESPONDENT.]

UNION CITY, April 26.

The Union City Iron Works, manufacturers of engines and mill machinery, employ 18 hands and have been established 10 years. They are about completing two engines for New York and one for Chicago. The production of the firm is ten engines a month, averaging from 8 to 40 horse-power each. The active demand which has set in for these engines is on the increase.——The Union City Chair Co., Union City, manufacturers of wood seat and perforated seat chairs, have built a large, fine building during the past season; it is two and a half stories high; the dimensions are 40x100 feet; it occupies the same site as the other building destroyed by fire last July, and three months from that time witnessed the works in full operation. The present firm, which has been in existence a little over one year, employs upwards of 40 hands. They ship principally to Eastern Ohio, Pennsylvania, and Western New York. The outlook is very good for the coming season, orders coming in faster than they can be filled.——I have paid a gratifying visit to the Union City Pump Co.'s works, which are under the management of Mr. J. W. Hunter. Here are manufactured wood and porcelain lined pumps, orders for which are chiefly from New York, Pennsylvania and Ohio. Eleven hands are employed.——Harmon, Gibbs & Co., steam engine builders, and manufacturers of oil well, mill and factory steam engines, and all kinds of machinery, have their hands full, but could afford to greet your correspondent with all the equanimity of gentlemen of leisure. It requires but a glance to perceive that their works are splendidly organized. It is gratifying to find men so worthy of success, enjoying it. I found them executing, among their many orders, one from the North Chicago Rolling Mills for two engines, respectively of 100 and 150 horse-power; also two engines for the Chicago Rolling Mill Co. at North Chicago, and another of 100-horse-power for South Chicago people. Their brass goods are unexcelled, and they are experts in steam fittings and engine appurtenances. They turn out shaftings, pulleys and hangers, and carry on a large business in castings. They employ 30 hands. The members of the firm are C. G. Harmon, Lewis L. Bliss, C. H. Bagley and George H. Gibbs.——The Corry Novelty Works, H. King & Son, sole manufacturers of King's patent portable engine, employ 20 hands. They have been established eleven years. Trade has been remarkably good the past season, and prospects are flattering. Several orders to fill are on hand for California people; shipments are made all over the Union, and there is a good home trade for their engines, which have been characterized by durability, strength, accuracy and safety. One point that particularly recommends their steam engine is that they have guarded in the construction of these as much as possible from the effects of unskilled or careless management. They have produced an engine with an adjustment of the valve suitable for using the steam expansively and in such a manner as to secure the greatest amount of labor from a given amount of steam, and a boiler which would generate the greatest amount of steam with a given amount of fuel; all of which is accomplished to a degree probably only rarely attained in a small engine. The vertical engine possesses many advantages, and is peculiarly fitted for many locations. The extent to which these engines have been adopted in the past four years proves their value. General jobbing and repairing is undertaken. The members of the firm are Hollis and H. F. King.——A. M. Kent & Co., manufacturers of Corry wooden ware, employ 100 hands. Their works have been in operation three years. They ship principally to Pittsburgh and Cincinnati. The floods in the Southern States have latterly checked orders from that quarter, but activity reigns through all departments, and their business must be pronounced flourishing.

NEW YORK INDUSTRIES.

[FROM OUR SPECIAL TRAVELING CORRESPONDENT.]

OLEAN, N. Y., April 27, 1882.

Although my stay here has been brief, I have seen enough to indicate that Olean city, is holding its own in the industrial race.——The Variety Iron Works, of which Mr. J. H. Luther is proprietor, continue more actively engaged than ever in the manufacture of Luther's celebrated patent well tools. These works afford an instance of steady development, based on sterling merit. Mr. Luther commenced the manufacture of machinery and oil well supplies in Petroleum Centre in 1865. In 1873 he transferred his works to Karns City, and in 1881 established himself permanently in Olean. The building consists of a large frame structure one hundred and forty-seven feet in depth, and from thirty-two to thirty-seven feet wide. The machine shop proper is 88x32 feet, and the blacksmithing department is 37x46 feet in extent. One of the steam hammers has a capacity of 650 pounds. There are four forges in use in the blacksmith department. The machine shop is replete with powerful machinery of the best description. The hands, of whom there are twenty-five, are all skilled workers. Whilst the principal shipments are to the oil regions, the tools are in demand in other countries. Mr. Luther is a born inventor, and, unlike many other inventors, he has proved the practicability and value of all his devices, as he both manufactures and sells them. Among these are his socket, casing cutter, water packer, side socket for taking out broken jars, 'temper screw swivel,' 'pin socket,' 'patent collar socket,' 'boring bar' for boring holes of any desired shape, 'improved bar' for boring large cylinders, 'Luther bar' for boring off an oil well cylinder at the well without taking it from the block, a machine for straightening augerstems while hanging in the derrick, &c. The casing spear used for extracting casing in oil wells is one of Mr. Luther's valuable inventions, which be patented in 1880. The feature of this spear is in case of its breaking in the wells, it remains stationery, and can be easily lifted out, possessing in this respect an advantage over any other tool manufactured for this purpose.——Myrick, Brothers & Co., manufacturers of engines, boilers, horse powers, threshing and shingle machines, oil tools and rig irons, and all kinds of casting, etc., employ 25 hands. The business done last year by this firm was most satisfactory, and the orders coming in so far are a good augury for 1882. The shop was originally established by Eastman, Myrick & Co., in 1858, and was changed to its present title in 1864. The building occupied is 160 by 40 feet, and the machinery used has the latest improvements. Mr. F. H. Myrick, the general manager, who is a native of Orleans, Mass., is among the oldest residents of Olean. Of course, many of your readers would like to know where this inventive manufacturer came from. I asked him, and he stated that he was a native of Rhode Island, but hails from the State of Connecticut. At the works, saw mill work and machinery of any description is made to order or repaired on short notice.——The enormous wagon works of W. H. & D. C. Conklin, founded in 1850, are prominent among the industrial establishments of this city. The entire premises occupied by this concern cover over six acres of ground. The main structure, used for machine, wood, blacksmith and paint departments, is 75x150 feet in extent, while two store houses each respectively 150x32 feet and 50x60 feet are required for the storage of materials and finished work. The capacity of the works will be increased to double their present extent in the coming spring, by adding 150 feet to the main building. The fame of the works rests on the production of the well known Conkling wagon. These wagons are made ranging in size from a light delivery wagon up to a heavy freight wagon, and in their construction nothing but the best eastern growth of timber is used. During the first year of the existence of this industry only 150 wagons were made, and at the present time over 2,000 are turned out annually. Over fifty skilled hands are employed.——The Chamberlin Manufacturing Company, manufacturers of screw stump machines, blind ditching and sub-soil plows, claim to have the largest stump machine works in the world. They have been running full time the past season. Their trade has been excellent, especially from the States of Florida and Georgia. Prospects the coming season are most encouraging. The firm commenced operations in 1867. At the inception of this industry, only sixty-seven stump-pullers were built during the first year, but owing to the superiority of these machines, and the reputation they have gained, the demand for them has steadily increased, until during last year over three hundred were sold. This invention is due to Mr. George Chamberlin, the senior member, and was patented in 1867. It is made ranging in weight from 1,200 to 3,500 pounds, and is claimed to be the best in use. The members of the company are Mr. George Chamberlin and his sons H. W. and L. G. Chamberlin. The machine-shop is in charge of H. W. Chamberlin and the stove business is managed by L. G. Chamberlin.——A visit to the establishment of Mr. R. M. Whitney, where are manufactured black birch carriage, wagon and truck hubs, will prove exceedingly interesting to any visitor with a mechanical turn of mind. There is a good deal of science in the making of really good hubs, and Mr. Whitney without question is a master in this line. He obtains wide patronage owing to the excellence of his hubs. His machinery is of the most improved character. The sizes are from $3\frac{1}{2}$x$6\frac{1}{2}$ to 18x22, and are shipped to all parts of the United States.——The Olean Brewery, owned by Mr. Dotterwich, a native of Bavaria, and which dates from 1856, has a capacity of over 3,000 barrels per year. There is much more about the industries of Olean to record which I must reserve for another letter.

Heat Giving Qualities of Coal and Fuel.

Anthracite coal contains on an average 3.97 per cent. volatile matter, 88·54 per cent. fixed carbon, and 6·28 per cent. of ash. Free burning bituminous coal contains on an average 15·11 per cent. volatile matter, 73·21 per cent. fixed carbon, and 10·27 per cent. ash. Bituminous coking coals contain on an average 29·43 per cent. volatile matter, 58.29 per cent. fixed carbon, and 10·09 per cent. ash. Although the volatile gas in coal, when actually consumed, gives off a great amount of heat, yet in actual practice the difficulty of consuming it is so great that most of it escapes up the chimney, and the steam making capacity of coal is almost in direct proportion to the amount of fixed carbon contained in each kind. The composition of the different kinds of wood used as fuel is so nearly the same that when equally dry, the same weight of pine, tamarack or maple will yield the same quantity of heat, and produce the same quantity of steam. Wood, when newly cut and green, contains about 45 per cent. of moisture; and in the ordinary air-dried condition of fire-wood still retains at least 25 per cent. of moisture. Whatever moisture is contained in fire-wood has to be evaporated in the furnace, and absorbs just as much heat as if the water had been inside the boiler, but no good result comes from it. Whenever wood is used as fuel it should be kept under cover, in order to keep it dry as possible, especially in the winter, when snow and ice are so apt to accumulate on it. Wood is sometime thrown into boiler furnaces with so much of snow and ice adhering to it that all the heat from the stick is used in evaporating its load of ice and snow, and there is none left for the boiler. The evaporative power of good coal in a suitable furnace may be taken, at a fair average, to be 10 pounds of water evaporated from and at 212° per pound of coal. In many trials this has been far exceeded, but much depends upon the condition and proportions of the boiler, rapidity of combustion, and the skill of the fireman. The evaporative power of air-dried fire-wood in sound condition cannot be taken as higher than $3\frac{1}{2}$ pounds of water evaporated from and at 212° per pound of wood. A cord of sound, dry pine would weigh about 2,400 pounds, and would be equal to about 840 pounds of good coal. Coal at $6.50 per net ton, would be equal to sound pine at $2.70 per cord; or to maple at $3.20 per cord.

THE practical $5 Standard Electric Belt advertised in this paper should not be confounded with other electric goods.

MECHANICAL RECEIPTS AND ITEMS.

Covering for Steam Pipes.

The following recipe provides a cheap and simple non conducting covering for steam pipes: Four parts coal ashes, sifted through a riddle of four meshes to the inch, one part calcined plaster, one part flour, one part fire clay. Mix the ashes and fire-clay together to the thickness of thin mortar, in a mortar-trough; mix the calcined plaster and flour together dry, and add to it the ashes and clay as you want to use it; put it on the pipes in two coats, according to the size of the pipes. For a 6-inch pipe, put the first coat about 1¼ inches thick; the second coat should be about ½ inch thick. Afterward finish with hard finish, same as applied to plastering in a room. About 2½ hours will be required to set on a hot pipe.

Dissolving Soft Solder.

Generally speaking, old work, which has to be repaired, regilt or colored, contains soft solder, the result of being mended by inexperienced persons. All this must be removed or destroyed before the articles can be properly repaired. It is a general belief among workmen that annealing and boiling out will destroy it, but it really has a contrary effect, the heat thus given tending only the more closely to amalgamate the solder with the gold. We have often tried to remove the solder after the annealing process by scraping and filing, and have always found that it had penetrated so deeply into the gold that it would be utterly impossible to eradicate it by any such means. One of the common methods of treating this class of solder in the workshop is to remove whatever you can by means of the scraper (which consists of a three-square file sharpened at the point), and then to place the article in tolerably strong muriatic acid for some time. Nitric acid is a much quicker way, but it cannot be safely applied to articles of inferior qualities of gold as the acid would act upon the alloy of which they are partly composed; but for colored gold it may be used with advantage and safety. From a long practical experience in the matter of soft metals, we have arrived at the conclusion that there is no better way of treating it than that which we are about to point out. The solvent employed is a mixture of muriatic acid and crocus (jeweler's polishing material), and prepared as follows: To 8 oz. of muriatic acid add 1 oz. of crocus, and well shake it, in order that it may become perfectly mixed; of this mixture take 1 oz., and add to it 4 oz. of hot water, place it in a pipkin, and keep up the heat by means of a gas jet; put the articles containing the soft solder into it, and soon the desired result will be achieved

Brightening Iron.

A Bavarian serial contains a method of brightening iron recommended by Boden. The articles to be brightened are, when taken from the forge or the rolls, in the case of such articles as plates, wire, etc., placed in dilute sulphuric acid (1 to 20), cleansing the articles, which are then washed clean with water and dried with sawdust. They are then dipped for a second or so in nitrous acid, washed carefully, dried in sawdust and rubbed clean. It is said that iron goods thus treated acquire a bright surface, having a white glance, without undergoing any of the usual polishing operations. This is a process that those interested can easily test for themselves. Boden states that the action of the sulphuric acid is increased by the addition of a little carbolic acid, but it is difficult to see what effect this can have, and it may very well be dispensed with.

To Remove Blue Color From Iron and Steel.

When this color has been caused by exposure to heat, rub lightly with a sponge or rag dipped in diluted sulphuric, nitric, or hydrochloric acid. When the discoloration is removed, carefully wash the article, dry it by rubbing, warm it and give a coat of oil or it will rapidly rust.

Tempering a Cast-Iron Surface.

It is stated that the surface of cast iron can be tempered by immersion in aqua regia diluted with water.

"BLUE GRASS ROUTE OF OHIO."—The Cleveland, Akron and Columbus Railroad.

PITTSBURGH parties have bought the Murraysville gas well, eighteen miles from Pittsburgh, for $20,000, and the gas will be utilized at two very large works in the vicinity of Pittsburgh.

THE "PHOENIX" ENGINE.

I. H. PRATT.

No. 15 South Water St., Cleveland, O.

These engines are built from entirely new and improved patterns, are remarkably compact, strong, simple in construction, and of the best materials and workmanship. The ports are of large dimensions, and the valve motion is especially designed for a high rate of speed. Mr. Pratt has tested these engines practically, running at a speed of 800 feet per minute, and can therefore guarantee them to run without injury at a much higher rate of speed than is given in the table he embodies in his business circulars. The form of construction is such as to ensure perfect aligment. All the parts are made to special steel templets and gauges, thus ensuring exactness and perfect uniformity.

These engines present every advantage to the steam user, at a low price, and are offered in competition with any good engine. As Mr. Pratt is making a specialty of these engines, all of the sizes are kept in stock.

All of these engines are of the same general style and appearance as shown in our advertisement columns. The pump is fastened to the cylinder, is driven by the cross-head, and may be disconnected or taken off in 1 minute. The pump-seats and valves are brass. The heater is fastened to the bottom of the cylinder, and extends back through the center of the bed as far as the second opening, and is thus completely out of the way. It is made so that the exhaust may be taken out at either side. The heater is not connected to the bed, and may be taken out by simply unfastening the bolts that fasten it to the cylinder. The heat from it does not affect the bed, nor can any harm be done the bed, by the bursting of the heater by frost. The cross-head is fitted with brass gibs, top and bottom, which are adjustable. The cross-head wrist pin is made of steel. This feature is a great improvement on the old style of casting the pin in cross-heads, as it is stronger and turned perfectly true. The cross-head end of connection rod has a taper brass bushing, the wrist-pin also is taper, and the wear is taken up by means of the nut. The other end of the rod is fitted with gib and key. The piston and valve rods are steel.

A NOVEL METHOD OF MAKING ROPE.—A new industry, in which the entrails of sheep are used in the production of what is pronounced an exceedingly strong and durable article of belting, has been introduced at Oakland, Cal. The process of manufacture is described as follows: The entrails, which will average about 55 feet in length, are first thoroughly cleaned, and then placed in vats of of brine, where they remain some days. When thus prepared, they are not much thicker than a piece of common cotton twine, and will sustain a weight of about ten pounds. The next stage in process of manufacture is to wind the prepared material on bobbins, after which the process is the same as in making common rope This method is used to produce a round belt; but where a wide, flat belt is to be made, a loom is employed, and the fine strands are woven together, as in ribbon manufacture. The flat belts are made of any size, and the round of sizes vary from 1-16th inch up to 1½ inches in diameter. The round belts are made either in the form of a smooth cord, or as ropes with from three to five large strands The ¾ inch rope is said to stand a strain of seven tons, and is guaranteed to last ten years. Hemp rope will last, on an average, not over three years. Three-eighths round cord, containing 150 strands, will endure a strain of about 4 tons.

HASLAM'S dry air freezing machine, already fitted up on several of the largest steamships bringing supplies of fresh meat to England from the Australian Colonies and South America, is now in operation on the sailing-ship *Mataura*, which is by its means enabled to carry 200 tons of frozen meat. A telegram received a few days ago states that the *Mataura*, after a voyage of 95 days, has arrived in New Zealand, and that the merchants of Dunedin, Otago, and other ports, have been most agreeably surprised by receiving parcels of English fish and game in splendid condition, sent to them as presents by friends in the London Colonial shipping trade. This is the first time that such an interesting cargo has reached New Zealand, and on this account, as well as from the fact that the frozen game and fish were conveyed by the slow process of a sailing-vessel, deserves to be placed on record.

MISCELLANEOUS RECEIPTS.

FILLER FOR POROUS HARD WOOD.—Stir boiled oil and corn starch into a very thick paste, add a little japan, and reduce with turpentine, but add no color for light ash. For dark ash and chestnut use a little raw sienna; walnut, burnt umber and a slight amount of Venetian red; for bay wood burnt sienna. In no case use more color than is required to overcome the white appearance of the starch unless it is wished to stain the wood. Let it dry forty-eight hours, or until it is in condition to rub down with No. 0 sand paper, without much gumming up, and if an extra fine finish is desired, fill again with the same materials, using less oil, but more of japan and turpentine.

TO PURIFY LUBRICATING OIL.—Lubricating oil may be made fit for repeated use if the impure lubricant is gathered in a receiver, and from there slowly flows into a reservoir through a tube, a cock serving to regulate the flow. The solid particles held in suspension by the oil are here deposited, while the latter passes over a partition, and enters a second reservoir where the last traces of solid material are precipitated. The oil finally arrives in a compartment containing two boxes filled with clean cotton waste; these two boxes are separated by a slight partition, and the oil, after having passed through them, collects in a small basin, from whence it may be removed by means of a cock. The intermediate reservoirs are also provided with cocks in order to facilitate the removal of sediment, and the various tubes are so arranged as to allow a free circulation of air. This apparatus is capable of furnishing about 30 kegs of purified oil daily, the amount depending to some extent upon the nature of the oil.

TO MAKE AN ENAMEL FOR TINWARE OR IRON.—Take fine kaolin 3 parts, silica ½ part, calcined borax 1 part; mix and fuse in a crucible; remove from fire and stir in one part fine umber; cool quickly, grind to a fine powder, mix with water to a paste, and apply to the clean metal. Dry slowly in a warm place, then heat gradually until the enamel fuses; cool slowly.

IMPERMEABLE BLACK VARNISH.—This varnish is a combination of three ingredients; tannin, tar or pitch, and supersulphate of iron. It is more or less brilliant, and more or less impermeable, according to the proportions of these three substances. The apparatus used in its preparation is the most simple. It is only necessary to procure a vase or receiver which will contain a certain quantity of the product. This varnish may be applied either on wrapping paper or on strong paper, upon pasteboard, upon light roofing, in short, upon all that needs to be varnished or made impermeable.—[Translated for The Textile Record from Monde des Produits Chim.

TO ENAMEL PHOTOGRAPHS.—After the prints have been toned, washed and trimmed in the usual way, they are immersed in a warm filtered aqueous solution of gelatin of about the consistence of collodion, to which is after added a small quantity of sugar candy. When the paper has become well impregnated with the liquid the pieces are removed and placed, smooth face downward, upon a plate of glass previously coated with a four per cent. normal collodion, and fair-dried. In placing the print care must be taken to quickly press out all air bubbles. Afterward a sheet of stout white paper, cut somewhat larger than the prints, is cemented to the back of each photograph to protect the pictures in the event of their spontaneously leaving the glass on drying. The plates are allowed to remain over night in a dry locality, when the portraits may be separated from the glass by making an incision of the film all around the paper.

A USEFUL ALLOY.—The following alloy, it is said, will attach itself firmly to glass, porcelain, or metal. Twenty to thirty parts of finely pulverulent copper, prepared by precipitation or reduction with the battery, are made into a paste with oil of vitriol. To this seventy parts of mercury are added, and well triturared. The acid is then washed out with boiling water, and the compound allowed to cool. In ten or twelve hours it becomes sufficiently hard to receive a brilliant polish, and to scratch the surface of tin or gold. When heated it is plastic, but does not contract on cooling.

TO RENDER PAPER, LEATHER, ETC., SOFT AND FLEXIBLE.—Messrs. Fitch and Barton, of London, employ for this purpose the following process: It is treated with a solution of acetate of soda, or of potash dissolved in four to ten times its weight of water. For permanent paper, to twenty parts of this solution one part of starch or dextrine is added. If the paper has to be made transparent, a little of a solution containing one part soluble glass in four to eight parts water is added. To render the paper fit for copying without being made wet, to the acetate solution chromic acid or ferrocyanide of potassium is added.

PRACTICAL MECHANICS.

Casting Ingots.

To produce an ingot of different grades of metal, for use in the manufacture of articles of steel or homogeneous iron, or iron and steel which shall possess the toughness of one grade of metal, and the hardness of the other grade, Mr. E. Wheeler, of Philadelphia, uses by preference two Bessemer converters—one for one grade and the other for another grade of metal, and prepares a mold in which is placed a core. The metal is poured from one converter into the mould, and when that portion of the metal in contact with the core has become sufficiently hard the core is removed, the hard skin preventing the fluid metal from flowing into the space left by the core, into which space is at once poured molten metal of a different grade from another converter. This last mass of metal fuses the hard skin left by the withdrawal of the core from the first mass of metal, and the two metals become united and form a homogeneous ingot, in which, however, they occupy distinct positions. In some cases the ingot is formed by heating a bar of one grade of steel or homogeneous iron nearly to the point of fusion, placing it in the mold in place of the core described above, and pouring another grade of metal into the space around the bar, the heat of this metal being sufficient to fuse the outer portion of the core, and thus effect a union of the two metals. If it is desired to prepare an ingot with a soft center and a hard exterior, the metal which is poured around the core may be cheap high-phosphor steel or iron, while the metal which takes the place of the core is soft iron or steel low in carbon or homogeneous iron. If, on the other hand, it is desired to prepare an ingot with a hard center and a soft, tough exterior, the soft metal is poured around the core, and the high-phosphor metal is poured into the interior. This latter arrangement of the metals in the ingot is especially desirable when it is to be employed in the making of armor plating. When the ingot is to be worked up into railroad rails it is preferable to make it with a hard center and a soft exterior, with a preponderance of the soft metal on one side, so that when the ingot has been rolled into rails the head will be of hard metal, while the flange and sides will be soft. In ordinary rails, on the contrary, the head is almost invariably soft, while the flange is hard, owing to the rapid cooling of the thin parts, while the head cools more slowly, and is consequently softer. The ingots thus cast being of malleable metal, may be worked up into almost any and all articles of manufacture.

The Mechanical Treatment of Steel.

BY ALBERT F. HILL, C. E.

Influence of Mechanical Treatment.

Of even greater importance to the engineer than the knowledge of the effects of chemical composition, is the knowledge of the effects produced upon steel by different forms of mechanical treatment, such as hammering, punching, shearing, annealing, tempering, &c. The effects of such treatment are, in most cases, so decisive in their influence upon the mechanical properties of the material, as to completely controvert the conclusions and expectations based upon chemical analysis; that is, if, for instance, this latter, or even actual physical tests, have shown us, that we have a mild steel of great ductility to deal with—subsequent shop manipulation may change it into a hard, brittle, and unfit material for construction, and vice versa—mechanical treatment may be successfully called to our aid in correcting certain desirable properties due either to chemical composition or to previous mechanical treatment. This also enables us to meet most readily certain peculiar requirements of steel construction, and puts into our hands the means of equalizing the service of different grades.

Influence of Annealing.

The operation of annealing is, of all forms of mechanical treatment, the one of greatest importance to the engineer. Its effects are marked by a reduction of the elastic limit and ultimate strength, and an increase in the ductility of the steel. In this way we can, therefore, counteract the effects of local hardening, caused by punching, cold-hammering, &c. Annealing also enables us to make use, in construction, of steel otherwise too high in carbon, by increasing its ductility to the required standard. It is desirable to find out how much of the loss in strength of the manufactured eye-bar, as compared with the original bar, is due to annealing after forming the eyes, and how much of it is due to this process of making the eyes. In order to this, alternate test pieces should be annealed in the same manner as subsequently the eye-bars, viz., heated slowly to a dark red heat, and then quickly covered with fine ashes so as to prevent too rapid or unequal cooling. The effects of shearing, punching and hammering of steel are marked by an increase in the hardness of the material extending over a more or less well-defined area, immediately surrounding the points at which these operations were performed, thus raising the elastic limit in these places and impairing the homogeneity of the material. The great corrective of these bad effects is annealing. In a series of experiments conducted at Chatham a few years ago, eight plates ½ inch thick, were taken, and four holes ⅝-inch diameter were punched in each. The plates were then cut in two, so that each plate made two test pieces, one only of which was annealed. The whole sixteen pieces were then cut in two, so that each plate made two test pieces, one only of which was annealed. The whole sixteen pieces were then tested for ultimate tensile resistance; the unannealed ones giving an average of 42,194 pounds per square inch of section, whereas the average of the annealed ones was 65,678 pounds per square inch of section, being an increase of 22,484 pounds per square inch, or 55.66 per cent. The results are somewhat unsatisfactory because no tests were made to ascertain the original strength of the plates, so as to furnish an indication of the amount of deterioration due to the punching, and the amount of restoration effected by subsequent annealing. Neither do the tests give an analysis of the steel nor a statement of its mode of manufacture. While there is no doubt of the beneficial results obtainable from careful annealing, it must be conceded on the other hand that this treatment is liable to do more mischief than good, unless properly performed. Great care must be exercised in the heating, in order to prevent oxidation or partial decarburization. It ought, whenever possible, to be performed in a gas furnace, so as to avoid all actual contact with the fuel itself, and at a temperature higher than that at which the steel has been previously worked. This will, in most cases, be accomplished by a temperature not much higher than is required for heating to cherry-red. The cooling ought to be as slow as possible, and contact with the air avoided. All these conditions would require for their strict fulfilment, in the annealing of large masses, such an extension of plant and labor as to materially affect the cost of the steel. The main question to be solved is the construction of a suitable annealing furnace, capable of receiving the long pieces, such as eye-bars, &c. The cooling need not necessarily be done in a close chamber, as steel after being heated can be taken out and quickly covered with dry sand or lime, which will answer all purposes.

The Welding of Steel.

One of the most serious obstacles that confront us in the adoption of steel for purposes of bridge and other construction, is the distrust of its welding capacity. That this distrust is founded far more upon prejudice than upon fact is becoming more and more apparent, with a clearer perception of the difference in the methods of working iron and steel. Again the "carbon line" becomes our guide, and we soon find that the welding ability of steel is in inverse ratio to the carbon percentage—that is, the facility with which steel may be welded to steel, diminishing as the metal approximates to cast iron with respect to the proportion of carbon; or, what is equivalent, it increases as the metal approximates to wrought iron with respect to the absence of carbon. Nevertheless, steels far in excess in carbon per centage of any that can ever be used in construction, have been successfully welded by proper treatment. The Mersey Steel Works has succeeded in welding mild Bessemer steel forgings, without any flux, in the same way as ordinary iron. This metal before welding showed to analysis: Carbon, 153; phosphorus, 089; Silicon, 026; Manganese, 785.

To prevent decarburization and to render the welding places perfectly clean, various welding powers have been recommended, but have never come largely into use—for, after all, a good and clean weld, be it in iron or steel, depends upon the skill and the intelligence of the blacksmith. Unfortunately the latter is only too often dogmatic and obstinate; "knows all about steel," and therefore cannot be taught anything. If the steel-maker has furnished the constructing engineer with otherwise good steel, that somehow or other, "will not weld," the latter will probably discover the source of the trouble in the blacksmith shop. Lieutenant Barba, in his book on "The Use of Steel," relates a characteristic incident in his experience during the construction of the steel ships before referred to, which is quite in point. The blacksmiths intrusted with the work of bending steel plates and angles wanted to treat them like ordinary iron, and persistently violated instructions. After several cases of rupture had been observed, these men were replaced by carpenters, inexperienced in taking care of a fire, and, not "knowing all about it," who were therefore disposed to pay the closest attention to the instructions received. They completely succeeded without a single failure, and there was an end to "the trouble with the steel."

There is one point in welding steel which cannot be too strongly insisted upon, and that is that the pieces, after having been brought to welding point, should not be struck heavily with the hammer, but only tapped lightly at first, until they have begun to weld; after that the sledge or steam hammer may be used with perfect freedom.

Brass-Casting.

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THE Mt. Vernon, Coshocton and Wheeling railroad is to run from Marion, O., through Mt. Gilead, Mt. Vernon, Coshocton, and take the Wheeling and Lake Erie about twenty-two miles above Wheeling. In 1873 the Legislature passed a law granting any prospective railroad corporation which desired it the right to use the bed of the Walhurding Canal in certain localities for track purposes, and the incorporators will apply for twenty miles of the bed, which will effect a saving of $100,000. The grading is completed from Norwalk to Toledo. Track laying is progressing rapidly from east to west, and from west to east. The bridge over the Portage river at Oak Harbor, and the one over the Maumee are about completed. The company are preparing to commence work between Bowerstown and Sherodville; grading north of the latter place is about finished. The contract for grading from Massillon to Zoar has been let. The commission of U. S. engineers has fully approved the plan of the company for a bridge over the Ohio, and granted the company the privilege of choosing three locations pointed out to the engineers. The road is in full operation between Massillon and Norwalk, is in good condition, and the earnings are unexpectedly large.

A CHANGE in the running division of the C., C., C. & I. Ry. from Cleveland to St. Louis is being made. The first division will be from Cleveland to Bellefontaine; the second, Bellefontaine to Indianapolis, and the third, from Indianapolis to St. Louis. The road, by their attorney, Gen. R. P. Kennedy, has purchased seventy-seven acres of land for shops, round houses and sidings, and will break up their works at Union and Galion, and consolidate them at Bellefontaine. The yard tracks, when completed, will be the most complete and perfect system on the road, embracing 29 tracks, making more than 30 miles in length.

WORK on the new bridge on the Monongahela river at City Farm and over the Youghiogeny at McKeesport for the Pittsburgh and Lake Erie extension has begun. It will be of mammoth proportions, measuring one mile and 120 feet in length, and will require about 2,250 tons of iron. It will be, it is claimed, the longest iron structure in the United States, and is to be completed by December 1st.

THE Pennsylvania Railroad was incorporated April 13, 1846. In its early days many feared that the road would become bankrupt. The company now controls about $400,000,000 capital, and operates 8,000 miles of track, with an annual freightage of 6,000,000 tons, and carrying 30,000,000 passengers, with earnings over and above expenses of $29,000,000.

THE telegraph line from Washington to Pittsburgh on the line of the Pittsburgh Southern Railroad has been completed.

THE Shanghai Courier states, "on the best authority," that railroads through a portion of the Chinese empire will be commenced within the present year. The commercial support on the part of the Chinese merchants has already extended as far south as Canton, where a subscription up to the amount of Tls. 10,000,000 is guaranteed. The pioneer line will run, in the first instance, (contrary to preconceived notions,) from Tientsin to Peking, and will then be extended to the route which the Imperial Telegraph lines already traverse.

OVER ten miles of track, on the Niles, Alliance and Ashtabula road have been laid.

WORK of the Valley extension is progressing rapidly, track-laying being completed to the second bridge, five miles south of Canton, O. The road bed is all ready for ties down to Sandyville.

THE Baltimore and Ohio road has purchased the right of way under an old survey from New Richmond, Ohio, up the river.

THERE is a prospect of the new re-organization scheme of the Connotton Valley Railway proving successful. Two-thirds of the bondholders have assented to it.

THE plan of reorganization of the Marietta & Cincinnati, as amended and now submitted for adoption provides for the consolidation with the company of the leased Cincinnati & Baltimore and the Baltimore Short Line companies. The road is to be sold under foreclosure and a new company organized.

THE Columbus, Hocking Valley & Toledo Company works a line from Toledo, O., through Columbus to Athens, 200 miles; the Ohio River Division, from Logan to Pomeroy, 83 miles; the Straitsville Branch, from Logan to Straitsville, 13 miles; the Monday Creek Branch, from Nelsonville to Monday Creek Junction, 17 miles; the Snow Fork Branch, from Snow Fork Juuction to Orbiston, 3 miles; a total of 316 miles, of which 310½ miles are owned, and the use of 5½ miles, from Toledo to Wallbridge, is leased from the Pennsylvania Company. The following brief statements are all that have so far been published for the year 1881. The capital stock is $10,317,200; the amount of bonded debt is not stated. The income account for the year was as follows: Gross earnings ($7,974 per mile) $2,519,750; expenses (52.75 per cent.) ($1,329,168; net earnings ($3,768 per mile) $1,190,582; interest charges ($1,971 per mile) $622,881; surplus for the year, $567,701. This surplus was equivalent to 5½ per cent. on the stock.

MINES AND MINING.

UP to the end of the year 1876 the Comstock mine had paid $82,000,000 in dividends, and collected $40,000,000 in assessments, leaving a clear profit of $42,000,000, a good deal of which found its way into the pockets of the people. During the last four years the Comstock has paid about $20,000,000 in dividends, and collected about $50,000,000 in assessments, showing a loss of $30,000,000, all of which came out of the same pockets. The Comstock formerly employed some 10,000 men. It now employs less than one-fifth that number. Virginia City is being deserted; the consumption of goods at the mines has dwindled to a mere nothing; the "lightning express" runs nearly empty every day.

THE Menominee M. Co., Mich., have sold to the Cambria Iron Company, of Pennsylvania, the Quinnisec, Norway, Cyclops and all the Vulcan mines for the sum of $1,800,000, and the Cambria will soon take possession of these immense properties. There is also a rumor current that the Cambria offered $3,000,000 for the Chapin, and that the Menominee Company asked $5,000,000. We consider this as a mere rumor. We do not think any one mine on the range worth $3,000,000, much less $5,000,000.

THE N. Y. Mining Record observes of the operators of the Comstock lode: What remains of the old bonanza firm is still the controlling power so far as the Comstock lode is concerned, and as they have heretofore been able to do pretty much as they pleased with respect to these so-called great properties, the probabilities are that they will continue to abstract from the pockets of the shareholders and operators what they fail to obtain from their mines. The faith of the public in these mine manipulators is something surprising to those who calmly view the prospect, with the experience of former days before them, and when one device to inspire fresh courage fails, another almost invariably succeeds.

THE showing of copper at the Richards Copper Mine, Va., is very gratifying to the company. A single blast, with half a charge, threw out lately a large quantity of excellent ore, and among it was a solid lump of virgin copper, weighing sixty-five pounds.

AT the Conrad Hill gold and copper mine, Davidson Co., N. C., they have started up the twenty stamp mill. They have out three or four thousand tons of free milling ore, and as much copper ore. They have erected smelters for working this copper ore, and will soon put them in operation. The mine is looking well, and bids fair to be one of the permanent ones of the State.

THE Lake Superior Iron Co., Mich., have been exploring with considerable success on the southern slope of the hill lying to the south of what is now the main workings of the mine. Two test pits have revealed a vein of hard ore known to be already forty feet in width.

THE Bonanza tunnel, Col., has reached a depth of 1,210 feet. The tunnel will pass clean through Bonanza mountain, aud when completed will be over 4,000 feet in length. Explorations are being made on a number of the veins, and there are now fully 2,500 tons of good concentrating ores on the dumps. As soon as sufficient water can be had, and other preparations are made, these ores will be concentrated at Humphrey's mill. Sixteen veins have already been cut in this tunnel, some of them showing up very fine. The Maryland vein, cut a depth of 400 feet from the mouth of the tunnel, is a large, rich vein, and has produced in former workings from surface $96,000.

THE correspondent of the Mining Record, at Summit Co., Col., writes: Mr. John P. Scarf, who has spent the winter in the district writes that the claims all show surprising results for the amount of development. The ores carry gray copper, galena, sulphurets, chlorides, bromides, silver glance and copper pyrites. Assays run as high as 21,000 ounces of silver to the ton. The Chloride lode, near the Doderberg, outcrops for 750 feet from the discovery. The Gray Copper lode is a strong vein of gray copper and peacock iron, which assays fifty to 400 ounces silver per ton. The Snowdrift lode assays from 100 to 400 ounces silver per ton. Capital has already been provided, and as soon as the season permits, the work of development will be rapidly pushed.

IN the annual report lately issued of the Huron Copper Mining Co. it is announced that the product of the mine for 1881 was 297,276 ponnds, mineral, which, at 85 615-1,000 per cent., gave 254,515 pounds ingot.

THE Horn Silver Mining Co. have declared their fifth dividend, one of three per cent. on the capital stock, aggregating $300,000, payable on the 15th of May. Total of five dividends $1,100,000.

COPPER discoveries are reported in the Jerillos Mountains, New Mexico.

THE Copper Queen mine, Arizona, produced for seven days ending April 9, 178,000 pounds of copper.

A DISCOVERY has been reported near Laramie, Wyoming, of a copper mine, which has a vein of chlorides nearly 40 feet wide.

THE average annual profits of the Atlantic copper mine, Michigan, have been $50,789.38 from 1875 to 1881, inclusive, or $425,525.66 in the aggregate.

THE new strike on the Chrysolite, at Leadville, Col., continues to show well. The ore nets above the cost of smelting, $70 a ton.

THE Evening Star Mining Company continue their stream of dividends, Nos. 42 and 43, each of five per cent. a share on the capital, paid on the 28th inst., the two aggregating $50,000. Total of forty-three dividends, $1,075,000.

THE La Plata Mining and Smelting Company have announced their thirty-second monthly dividend of seven and one-half cents per share, as also an extra dividend of two and one-half cents per share, the two aggregating $20,000. Total of dividends to date, $510,000.

NEAR the Valley Railway extension bridge five miles south of Canton, O., is the Fox Run coal mine, where they have a half-foot vein of good ore; a switch is being laid to the mines, and it is thought the coal trains from these mines will be run in the course of a few weeks. The quality of this coal is said to be very fine, surpassing any in that section.

LARGE bodies of iron ore have been recently developed near Lamy, on the Atchison, Topeka & Santa Fe Railroad, and plans are being made to erect reduction works there. The freight on pig iron from the East to New Mexico amounts to more than its original cost in the market.

THE famous mine Nuestra Senor, of Sinaloa, Mexico, which has a vein of 118 feet, has been sold in Philadelphia for $1,500,000.

THE Chicago Scale Company are prospecting for a new site for new works; they have four foundries now wholly engaged in the manufacture of casings, etc.; and Charles McDonald, proprietor of the Hercules Iron Foundry, wants more capacious quarters, having on January 1, 1882, over $160,000 of orders on hand.

MONTGOMERY county, New Mexico, promises to excel, as a placer district, all counties in the Atlantic States.

CEMENT FOR PAPER, &C.—A cement which is said to be good for paper, etc., as well as for metals and glass, and which does not deteriorate by keeping, is manufactured by F. D. Claus, in Dantzic, (German patent), by mixing 40 grammes starch, 320 grammes chalk, in 2 litres cold water, and adding, whilst continually stirring, a caustic soda solution of ¼ litre at 20 deg. B. This cement is said to be as good as a stereotype cement, three to four sheets of silk paper only being used instead of six to eight.

PRACTICAL MECHANICS.

Casting Ingots.

To produce an ingot of different grades of metal, for use in the manufacture of articles of steel or homogeneous iron, or iron and steel which shall possess the toughness of one grade of metal, and the hardness of the other grade, Mr. E. Wheeler, of Philadelphia, uses by preference two Bessemer converters—one for one grade and the other for another grade of metal, and prepares a mold in which is placed a core. The metal is poured from one converter into the mould, and when that portion of the metal in contact with the core has become sufficiently hard the core is removed, the hard skin preventing the fluid metal from flowing into the space left by the core, into which space is at once poured molten metal of a different grade from another converter. This last mass of metal fuses the hard skin left by the withdrawal of the core from the first mass of metal, and the two metals become united and form a homogeneous ingot, in which, however, they occupy distinct positions. In some cases the ingot is formed by heating a bar of one grade of steel or homogeneous iron nearly to the point of fusion, placing it in the mold in place of the core described above, and pouring another grade of metal into the space around the bar, the heat of this metal being sufficient to fuse the outer portion of the core, and thus effect a union of the two metals. If it is desired to prepare an ingot with a soft center and a hard exterior, the metal which is poured around the core may be cheap high-phosphor steel or iron, while the metal which takes the place of the core is soft iron or steel low in carbon or homogeneous iron. If, on the other hand, it is desired to prepare an ingot with a hard center and a soft, tough exterior, the soft metal is poured around the core, and the high-phosphor metal is poured into the interior. This latter arrangement of the metals in the ingot is especially desirable when it is to be employed in the making of armor plating. When the ingot is to be worked up into railroad rails it is preferable to make it with a hard center and a soft exterior, with a preponderance of the soft metal on one side, so that when the ingot has been rolled into rails the head will be of hard metal, while the flange and sides will be soft. In ordinary rails, on the contrary, the head is almost invariably soft, while the flange is hard, owing to the rapid cooling of the thin parts, while the head cools more slowly, and is consequently softer. The ingots thus cast being of malleable metal, may be worked up into almost any and all articles of manufacture.

The Mechanical Treatment of Steel.

BY ALBERT F. HILL, C. E.

Influence of Mechanical Treatment.

Of even greater importance to the engineer than the knowledge of the effects of chemical composition, is the knowledge of the effects produced upon steel by different forms of mechanical treatment, such as hammering, punching, shearing, annealing, tempering, &c. The effects of such treatment are, in most cases, so decisive in their influence upon the mechanical properties of the material, as to completely controvert the conclusions and expectations based upon chemical analysis; that is, if, for instance, this latter, or even actual physical tests, have shown us, that we have a mild steel of great ductility to deal with—subsequent shop manipulation may change it into a hard, brittle, and unfit material for construction, and vice versa—mechanical treatment may be successfully called to our aid in correcting certain desirable properties due either to chemical composition or to previous mechanical treatment. This also enables us to meet most readily certain peculiar requirements of steel construction, and puts into our hands the means of equalizing the service of different grades.

Influence of Annealing.

The operation of annealing is, of all forms of mechanical treatment, the one of greatest importance to the engineer. Its effects are marked by a reduction of the elastic limit and ultimate strength, and an increase in the ductility of the steel. In this way we can, therefore, counteract the effects of local hardening, caused by punching, cold-hammering, &c. Annealing also enables us to make use, in construction, of steel otherwise too high in carbon, by increasing its ductility to the required standard. It is desirable to find out how much of the loss in strength of the manufactured eye-bar, as compared with the original bar, is due to annealing after forming the eyes, and how much of it is due to this process of making the eyes. In order to this, alternate test pieces should be annealed in the same manner as subsequently the eye-bars, viz., heated slowly to a dark red heat, and then quickly covered with fine ashes so as to prevent too rapid or unequal cooling. The effects of shearing, punching and hammering of steel are marked by an increase in the hardness of the material extending over a more or less well-defined area, immediately surrounding the points at which these operations were performed, thus raising the elastic limit in these places and impairing the homogeneity of the material. The great corrective of these bad effects is annealing. In a series of experiments conducted at Chatham a few years ago, eight plates ½ inch thick, were taken, and four holes ⅞-inch diameter were punched in each. The plates were then cut in two, so that each plate made two test pieces, one only of which was annealed. The whole sixteen pieces were then cut in two, so that each plate made two test pieces, one only of which was annealed. The whole sixteen pieces were then tested for ultimate tensile resistance; the unannealed ones giving an average of 42,194 pounds per square inch of section, whereas the average of the annealed ones was 65,678 pounds per square inch of section, being an increase of 22,484 pounds per square inch, or 55.66 per cent. The results are somewhat unsatisfactory because no tests were made to ascertain the original strength of the plates, so as to furnish an indication of the amount of deterioration due to the punching, and the amount of restoration effected by subsequent annealing. Neither do the tests give an analysis of the steel nor a statement of its mode of manufacture. While there is no doubt of the beneficial results obtainable from careful annealing, it must be conceded on the other hand that this treatment is liable to do more mischief than good, unless properly performed. Great care must be exercised in the heating, in order to prevent oxidation or partial decarburization. It ought, whenever possible, to be performed in a gas furnace, so as to avoid all actual contact with the fuel itself, and at a temperature higher than that at which the steel has been previously worked. This will, in most cases, be accomplished by a temperature not much higher than is required for heating to cherry-red. The cooling ought to be as slow as possible, and contact with the air avoided. All these conditions would require for their strict fulfilment, in the annealing of large masses, such an extension of plant and labor as to materially affect the cost of the steel. The main question to be solved is the construction of a suitable annealing furnace, capable of receiving the long pieces, such as eye-bars, &c. The cooling need not necessarily be done in a close chamber, as steel after being heated can be taken out and quickly covered with dry sand or lime, which will answer all purposes.

The Welding of Steel.

One of the most serious obstacles that confront us in the adoption of steel for purposes of bridge and other construction, is the distrust of its welding capacity. That this distrust is founded far more upon prejudice than upon fact is becoming more and more apparent, with a clearer perception of the difference in the methods of working iron and steel. Again the "carbon line" becomes our guide, and we soon find that the welding ability of steel is in inverse ratio to the carbon percentage—that is, the facility with which steel may be welded to steel, diminishing as the metal approximates to cast iron with respect to the proportion of carbon; or, what is equivalent, it increases as the metal approximates to wrought iron with respect to the absence of carbon. Nevertheless, steels far in excess in carbon per centage of any that can ever be used in construction, have been successfully welded by proper treatment. The Mersey Steel Works has succeeded in welding mild Bessemer steel forgings, without any flux, in the same way as ordinary iron. This metal before welding showed to analysis: Carbon, 153; phosphorus, 089; Silicon, 026; Manganese, 785.

To prevent decarburization and to render the welding places perfectly clean, various welding powers have been recommended, but have never come largely into use—for, after all, a good and clean weld, be it in iron or steel, depends upon the skill and the intelligence of the blacksmith. Unfortunately the latter is only too often dogmatic and obstinate; "knows all about steel," and therefore cannot be taught anything. If the steel-maker has furnished the constructing engineer with otherwise good steel, that somehow or other, "will not weld," the latter will probably discover the source of the trouble in the blacksmith shop. Lieutenant Barba, in his book on "The Use of Steel," relates a characteristic incident in his experience during the construction of the steel ships before referred to, which is quite in point. The blacksmiths intrusted with the work of bending steel plates and angles wanted to treat them like ordinary iron, and persistently violated instructions. After several cases of rupture had been observed, these men were replaced by carpenters, inexperienced in taking care of a fire, and, not "knowing all about it," who were therefore disposed to pay the closest attention to the instructions received. They completely succeeded without a single failure, and there was an end to "the trouble with the steel."

There is one point in welding steel which cannot be too strongly insisted upon, and that is that the pieces, after having been brought to welding point, should not be struck heavily with the hammer, but only tapped lightly at first, until they have begun to weld; after that the sledge or steam hammer may be used with perfect freedom.

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THE Indiana, Bloomington & Western extension to Springfield, O., will be opened for business June 1st. The track is the best 130 miles of new track in the country.

A STORY is told of a railroad conductor who was chosen deacon of a church. When it became his duty to take up a collection, he surprised the congregation by starting out with the characteristic ejaculation: 'Tickets, gentlemen!' The contribution that day was large. This would be a very good story if it were true, but no railroad conductor was ever made deacon of a church.

THE Mt. Vernon, Coshocton and Wheeling railroad is to run from Marion, O., through Mt. Gilead, Mt. Vernon, Coshocton, and take the Wheeling and Lake Erie about twenty-two miles above Wheeling. In 1873 the Legislature passed a law granting any prospective railroad corporation which desired it the right to use the bed of the Walhurding Canal in certain localities for track purposes, and the incorporators will apply for twenty miles of the bed, which will effect a saving of $100,000. The grading is completed from Norwalk to Toledo. Track laying is progressing rapidly from east to west, and from west to east. The bridge over the Portage river at Oak Harbor, and the one over the Maumee are about completed. The company are preparing to commence work between Bowerstown and Sherodville; grading north of the latter place is about finished. The contract for grading from Massillon to Zoar has been let. The commission of U. S. engineers has fully approved the plan of the company for a bridge over the Ohio, and granted the company the privilege of choosing three locations pointed out to the engineers. The road is in full operation between Massillon and Norwalk, is in good condition, and the earnings are unexpectedly large.

A CHANGE in the running division of the C., C., C. & I. Ry. from Cleveland to St. Louis is being made. The first division will be from Cleveland to Bellefontaine; the second, Bellefontaine to Indianapolis, and the third, from Indianapolis to St. Louis. The road, by their attorney, Gen. R. P. Kennedy, has purchased seventy-seven acres of land for shops, round houses and sidings, and will break up their works at Union and Galion, and consolidate them at Bellefontaine. The yard tracks, when completed, will be the most complete and perfect system on the road, embracing 29 tracks, making more than 30 miles in length.

WORK on the new bridge on the Monongahela river at City Farm and over the Youghiogeny at McKeesport for the Pittsburgh and Lake Erie extension has begun. It will be of mammoth proportions, measuring one mile and 120 feet in length, and will require about 2,250 tons of iron. It will be, it is claimed, the longest iron structure in the United States, and is to be completed by December 1st.

THE Pennsylvania Railroad was incorporated April 13, 1846. In its early days many feared that the road would become bankrupt. The company now controls about $400,000,000 capital, and operates 8,000 miles of track, with an annual freightage of 6,000,000 tons, and carrying 30,000,000 passengers, with earnings over and above expenses of $29,000,000.

THE telegraph line from Washington to Pittsburgh on the line of the Pittsburgh Southern Railroad has been completed.

THE Shanghai Courier states, "on the best authority," that railroads through a portion of the Chinese empire will be commenced within the present year. The commercial support on the part of the Chinese merchants has already extended as far south as Canton, where a subscription up to the amount of Tls. 10,000,000 is guaranteed. The pioneer line will run, in the first instance, (contrary to preconceived notions,) from Tientsin to Peking, and will then be extended to the route which the Imperial Telegraph lines already traverse.

OVER ten miles of track, on the Niles, Alliance and Ashtabula road have been laid.

WORK of the Valley extension is progressing rapidly, track-laying being completed to the second bridge, five miles south of Canton, O. The road bed is all ready for ties down to Sandyville.

THE Baltimore and Ohio road has purchased the right of way under an old survey from New Richmond, Ohio, up the river.

THERE is a prospect of the new re-organization scheme of the Connotton Valley Railway proving successful. Two-thirds of the bondholders have assented to it.

THE plan of reorganization of the Marietta & Cincinnati, as amended and now submitted for adoption provides for the consolidation with the company of the leased Cincinnati & Baltimore and the Baltimore Short Line companies. The road is to be sold under foreclosure and a new company organized.

THE Columbus, Hocking Valley & Toledo Company works a line from Toledo, O., through Columbus to Athens, 200 miles; the Ohio River Division, from Logan to Pomeroy, 83 miles; the Straitsville Branch, from Logan to Straitsville, 13 miles; the Monday Creek Branch, from Nelsonville to Monday Creek Junction, 17 miles; the Snow Fork Branch, from Snow Fork Junction to Orbiston, 3 miles; a total of 316 miles, of which 310½ miles are owned, and the use of 5½ miles, from Toledo to Wallbridge, is leased from the Pennsylvania Company. The following brief statements are all that have so far been published for the year 1881. The capital stock is $10,317,200; the amount of bonded debt is not stated. The income account for the year was as follows: Gross earnings ($7,974 per mile) $2,519,750; expenses (52.75 per cent.) ($1,329,168; net earnings ($3,768 per mile) $1,190,582; interest charges ($1,971 per mile) $622,881; surplus for the year, $567,701. This surplus was equivalent to 5½ per cent. on the stock.

MINES AND MINING.

UP to the end of the year 1876 the Comstock mine had paid $82,000,000 in dividends, and collected $40,000,000 in assessments, leaving a clear profit of $42,000,000, a good deal of which found its way into the pockets of the people. During the last four years the Comstock has paid about $20,000,000 in dividends, and collected about $50,000,000 in assessments, showing a loss of $30,000,000, all of which came out of the same pockets. The Comstock formerly employed some 10,000 men. It now employs less than one-fifth that number. Virginia City is being deserted; the consumption of goods at the mines has dwindled to a mere nothing; the "lightning express" runs nearly empty every day.

THE Menominee M. Co., Mich., have sold to the Cambria Iron Company, of Pennsylvania, the Quinnisec, Norway, Cyclops and all the Vulcan mines for the sum of $1,800,000, and the Cambria will soon take possession of these immense properties. There is also a rumor current that the Cambria offered $3,000,000 for the Chapin, and that the Menominee Company asked $5,000,000. We consider this as a mere rumor. We do not think any one mine on the range worth $3,000,000, much less $5,000,000.

THE N. Y. Mining Record observes of the operators of the Comstock lode: What remains of the old bonanza firm is still the controlling power so far as the Comstock lode is concerned, and as they have heretofore been able to do pretty much as they pleased with respect to these so-called great properties, the probabilities are that they will continue to abstract from the pockets of the shareholders and operators what they fail to obtain from their mines. The faith of the public in these mine manipulators is something surprising to those who calmly view the prospect, with the experience of former days before them, and when one device to inspire fresh courage fails, another almost invariably succeeds.

THE showing of copper at the Richards Copper Mine, Va., is very gratifying to the company. A single blast, with half a charge, threw out lately a large quantity of excellent ore, and among it was a solid lump of virgin copper, weighing sixty-five pounds.

AT the Conrad Hill gold and copper mine, Davidson Co., N. C., they have started up the twenty stamp mill. They have out three or four thousand tons of free milling ore, and as much copper ore. They have erected smelters for working this copper ore, and will soon put them in operation. The mine is looking well, and bids fair to be one of the permanent ones of the State.

THE Lake Superior Iron Co., Mich., have been exploring with considerable success on the southern slope of the hill lying to the south of what is now the main workings of the mine. Two test pits have revealed a vein of hard ore known to be already forty feet in width.

THE Bonanza tunnel, Col., has reached a depth of 1,210 feet. The tunnel will pass clean through Bonanza mountain, and when completed will be over 4,000 feet in length. Explorations are being made on a number of the veins, and there are now fully 2,500 tons of good concentrating ores on the dumps. As soon as sufficient water can be had, and other preparations are made, these ores will be concentrated at Humphrey's mill. Sixteen veins have already been cut in this tunnel, some of them showing up very fine. The Maryland vein, cut a depth of 400 feet from the mouth of the tunnel, is a large, rich vein, and has produced in former workings from surface $96,000.

THE correspondent of the Mining Record, at Summit Co., Col., writes: Mr. John P. Scarf, who has spent the winter in the district writes that the claims all show surprising results for the amount of development. The ores carry gray copper, galena, sulphurets, chlorides, bromides, silver glance and copper pyrites. Assays run as high as 21,000 ounces of silver to the ton. The Chloride lode, near the Doderberg, outcrops for 750 feet from the discovery. The Gray Copper lode is a strong vein of gray copper and peacock iron, which assays fifty to 400 ounces silver per ton. The Snowdrift lode assays from 100 to 400 ounces silver per ton. Capital has already been provided, and as soon as the season permits, the work of development will be rapidly pushed.

IN the annual report lately issued of the Huron Copper Mining Co. it is announced that the product of the mine for 1881 was 297,276 ponnds, mineral, which, at 85 615-1,000 per cent., gave 254,515 pounds ingot.

THE Horn Silver Mining Co. have declared their fifth dividend, one of three per cent. on the capital stock, aggregating $300,000, payable on the 15th of May. Total of five dividends $1,100,000.

COPPER discoveries are reported in the Jerillos Mountains, New Mexico.

THE Copper Queen mine, Arizona, produced for seven days ending April 9, 178,000 pounds of copper.

A DISCOVERY has been reported near Laramie, Wyoming, of a copper mine, which has a vein of chlorides nearly 40 feet wide.

THE average annual profits of the Atlantic copper mine, Michigan, have been $50,789.38 from 1875 to 1881, inclusive, or $425,525.66 in the aggregate.

THE new strike on the Chrysolite, at Leadville, Col., continues to show well. The ore nets above the cost of smelting, $70 a ton.

THE Evening Star Mining Company continue their stream of dividends, Nos. 42 and 43, each of five per cent. a share on the capital, paid on the 28th inst., the two aggregating $50,000. Total of forty-three dividends, $1,075,000.

THE La Plata Mining and Smelting Company have announced their thirty-second monthly dividend of seven and one-half cents per share, as also an extra dividend of two and one-half cents per share, the two aggregating $20,000. Total of dividends to date, $510,000.

NEAR the Valley Railway extension bridge five miles south of Canton, O., is the Fox Run coal mine, where they have a half-foot vein of good ore; a switch is being laid to the mines, and it is thought the coal trains from these mines will be run in the course of a few weeks. The quality of this coal is said to be very fine, surpassing any in that section.

LARGE bodies of iron ore have been recently developed near Lamy, on the Atchison, Topeka & Santa Fe Railroad, and plans are being made to erect reduction works there. The freight on pig iron from the East to New Mexico amounts to more than its original cost in the market.

THE famous mine Nuestra Senor, of Sinaloa, Mexico, which has a vein of 118 feet, has been sold in Philadelphia for $1,500,000.

THE Chicago Scale Company are prospecting for a new site for new works; they have four foundries now wholly engaged in the manufacture of casings, etc.; and Charles McDonald, proprietor of the Hercules Iron Foundry, wants more capacious quarters, having on January 1, 1882, over $160,000 of orders on hand.

MONTGOMERY county, New Mexico, promises to excel, as a placer district, all counties in the Atlantic States.

CEMENT FOR PAPER, &C.—A cement which is said to be good for paper, etc., as well as for metals and glass, and which does not deteriorate by keeping, is manufactured by F. D. Claus, in Dantzic, (German patent), by mixing 40 grammes starch, 320 grammes chalk, in 2 litres cold water, and adding, whilst continually stirring, a caustic soda solution of ¼ litre at 20 deg. B. This cement is said to be as good as a stereotype cement, three to four sheets of silk paper only being used instead of six to eight.

FACTS
For Machinists, Manufacturers and Others.

MOTIVE POWER FROM ELECTRICITY.—The difference between heat and electricity in their modes of mechanical action is very wide. Heat acts by expansion of volume, which we know to be a necessarily wasteful principle, while electricity operates by attraction and repulsion, and thus produces motion in a manner which is subject to no greater loss of effect than attends the motive action of gravity, as exemplified in the ponderable application of falling water in hydraulic machines. If, then, we could produce electricity with the same facility and economy as heat, the gain would be enormous; but this—as yet, at least—we cannot do. At present by far the cheapest method of generating electricity is by the dynamic process. Instead of beginning with electricity to produce power, we begin with power to produce electricity. As a secondary motor, an electric engine may, and assuredly will, play an important part in future applications of power, but our present inquiry relates to a primary, and not a secondary employment of electricity. Thus we are brought to the question, From what source, other than mechanical action, can we hope to obtain a supply of electricity sufficiently cheap and abundant to enable it to take the place of heat as a motive energy? It is commonly said that we know so little of the nature of electricity that it is impossible to set bounds to the means of obtaining it, but ignorance is at least as liable to mislead in the direction of exaggerated expectation as in that of incredulity. It may be freely admitted that the nature of electricity is much less understood than that of heat, but we know that the two are very nearly allied. The doctrine that heat consists of internal motion of molecules, may be accepted with almost absolute certainty of its truth. The old idea of heat being a separate entity is no longer held, except by those who prefer the fallacious evidence of their senses to the demonstrations of science. So also the idea of electricity having a separate existence from tangible matter must be discarded, and we are justified in concluding that it is merely a strained or tensional condition of the molecules of matter. Although electricity is more prone to pass into heat than heat into electricity, yet we know that they are mutually convertible. In short, we now know that heat, electricity, and mechanical action are all equivalent and transposable forms of energy, of which motion is the essence. At present we derive motive power from chemical attraction through the medium of heat only, and the question is, Can we with advantage draw upon the same source through the medium of electricity? The process by which we obtain our supply of heat from the exercise of affinity is that of combustion, in which the substances used consist, on the one hand, of those we call fuel, of which coal is the most important, and on the other of oxygen, which we derive from the atmosphere. The oxygen has an immense advantage over every other available substance, in being omnipresent and costless. The only money value involved is that of the fuel, and in using coal we employ the cheapest oxidizable substance to be found in nature. Moreover, the weight of coal used in the combination is only about one-third of the weight in oxygen, so that we only pay upon one-fourth of the whole material consumed. Further, we have conditions of the most favorable description for the production of energy, in the form of heat, and if we could only use the affinities of the same substances with equal facility to evolve electric energy instead of heat energy, there would be nothing more to desire; but as yet there is no appearance of our being able to do this. According to our present practice we consume zinc, instead of coal, in the voltaic production of electricity, which is 30 or 40 times dearer than coal.

ERECTING WROUGHT-IRON CHIMNEYS.—At the Pennsylvania Steel Works, at Harrisburg, they have a good plan of erecting the casings of fire-brick hot-air stoves and wrought-iron chimneys. Two new blast-furnaces are erecting there, with 6 Whitwell stoves, 18 feet diamer, 60 feet high. Instead of putting the *bottom* plates of the stove together on the ground, and building the rings up from bottom to top, they commence with the *top* plates and top rings of the stove. They are first erected on the ground and rived and calked complete, then with three very large screw-jacks, having a lift of about 6 feet, are placed at equal distances around the site of the stove.

DOES MINING PAY?—The *Daily Stock Report* answers the conundrum in the following substantial and statistical manner: Ask California, with her 865,000 inhabitants and production of $1,000,000,000 of gold since 1849. Ask San Francisco, with its 233,000 people, many of whom remember when her first houses were erected by the Argonauts, showing a growth in thirty-three years exceeding the capacity of the imagination to conceive of. Ask what would she be to-day had it not been for her gold mining. Has the discovery of the precious metals within her borders paid Colorado, the youngest of all the States, yet standing in the front rank in railroad building, whose coal and iron industries are rivaling those of the older States, and whose silver production takes first place in this or any other country? Ask Denver, the "Queen City of the West" whether mining has paid. Denver, with her 40,000 souls, all busy and happy, its buildings (erected by miners) rivaling those of the oldest cities of the East. Ask Leadville the city in the clouds, with its 20,000 people, all engaged in swelling its silver output to $13,000,000 per year. Ask the numerous camps throughout the State that helped augment Colorado's bullion production in 1881 to over $23,000,000. Has it paid Nevada? Has Eureka's $76,000,000 been devoid of benefit to that State? Has Comstock's $300,000,000 failed to infuse new life and energy in that Mecca of glittering wealth? So we might continue. Has it paid Arizona, New Mexico, Utah, Idaho, Montana, Dakota? Has it paid the whole country? Does it pay to add $84,000,000 annually to the enduring wealth of the nation? Has it paid to have the vast territory west of the Rocky Mountains opened up to settlement, to have the railroad reach from the Missouri River to the Pacific? Has it paid to have 2,000,000 hardy sons of toil people those wilds where only the Indian held sway a few years ago? Does it pay the Government to receive $1,000,000 per year for property that recently was inaccessible, and which would be to-day but for the miner, whose going before made it an object for the railroad to reach out and enjoy the benefits arising from his toil, and the railroad opened the way for the farmer and the tradesmen, so that to-day that which ten years ago was a vast, unbroken wilderness, with the savage lurking behind every bush, is now a blooming garden, sending forth its treasures to gladden the hearts of millions of toilers in the East, besides supplying this means to reduce our immense public debt? In view of these facts, can any one ask, "Does mining pay?"

MECHANIC ARTS IN THE SIXTEENTH CENTURY.—The German edition of "Flavius Vegitius" of 1534 abounds in curious and interesting wood cuts of machinery of many kinds. Here are revolving cannon, eight radiating from one central, fixed on a horizontal wheel which turns on its perpendicular axis. Another cut represents a combination of 16 guns, but does not show clearly how they were to be used. In the same book we find a boat, to be impelled by wheels turned by men seated as oarsmen, just as modern pleasure boats are sometimes arranged. Here, too, are sectional boats, to be taken apart for transportation, each section made water-tight. A cut is sometimes referred to which appears in the magnificent Como edition of "Vitruvius" of 1521, showing a ship with side wheels; the cut, however, represents a method of measuring the speed of the ship, not a wheel for propulsion. But this "Vitruvius" abounds in interesting cuts of water-wheels and other machinery. Boats drixen by wheels were not unfamiliar to men 300 years ago. In a treatise "De Rebus Bellicis," author unknown, published in Basle in 1552, a cut shows a proposed ship of war, which is nothing more or less than a ram, for sinking an enemy by piercing him under water. The vessel is driven by side wheels. turned by oxen on the deck, who travel around and turn a perpendicular shaft. On the opposite page of the same book is a pontoon bridge, with bellows lying beside it, the bridged described as to be supported on inflated calf skins prepared *arabica arte.*

MANUFACTURE OF GUN-COTTON.—The raw material consists of the fines t cotton waste, costing about £6 per ton, or double the price of the ordinary cotton waste employed so largely in factories for cleaning machinery. After having been carefully hand picked, the waste is fed into vertical iron cylinders, where it is dried by forcing in air having a temperature of 160 degrees Fahrenheit, by means of one of Root's blowers, the air being heated with the waste steam from one of the engines. When the drying process has been accomplished, the cotton is passed through a carding-machine, is rolled up into cylinders, and packed away until wanted. The conversion is effected by immersing one-pound charges on the dried cotton in a mixture of the strongest nitric and sulphuric acids, in the proportion of three parts by weight of the latter to one of the former. The cotton only remains for a minute or two in the acid, and is then taken out, and as much as possible of the acid is squeezed out of it by means of a lever hand press. It is then put into wide mouthed earthenware jars, covered with fresh acid, and the jars are allowed to stand in large shallow troughs of cold water, to prevent undue heating, for twenty-four hours. The conversion into gun-cotton is now complete.

LIGHTING APPARATUS.—So many losses have been caused by the use of gasoline vapor that few companies will insure manufacturing establishments lighted with gasoline vapor commingled with air, and the subject is hardly a live issue. The most important location to be avoided for lamps and gas burners is under the counter-shafts, so that a person, upon a ladder to clean a counter-shaft, could not reach a light. The destruction of the Kearsage mills was caused by waste igniting from a gas jet, as a man was descending a ladder after cleaning a counter-shaft. The overseer should be first in his room in the morning and the last out at night, and the lighting should be done by him or some responsible person subject to his orders, and nothing of the kind done in his absence. The gauze-covered safety-lamp is the preferable method of lighting the gas. This lamp should be lighted in the boiler-room or some equal safe place, and the use of friction matches absolutely prohibited on the premises. Gas pipes leading to a mill should be provided with a shut-off gate outside the building. If a few gas-lights are kept burning for the watchmen, they should be connected to a special small pipe, independent of the main supply to the other burners in the mill. Plain glass lamps are too fragile, and metal lamps frequently give trouble by leaking. These objections are met by the Bradley security lamp, which consists of a glass lamp within a metal case. These lamps have been in general use, and the writer has never heard of any accident in that connection.

THE SAFETY VALVE.—A steam user with large boiler, which he has furnished with a 4-inch valve as ample, will perhaps rest less easily when he learns that under a pressure of 90 pounds of steam the valve will give an opening in area not quite as large as the little finger nail (a little over ¼ of an inch in diameter). In other words, a round hole 5-16 of an inch in diameter would blow off a great deal more steam than an ordinary 4-inch safety valve. There is no piece of apparatus used upon a boiler which is more deceptive and unreliable than the safety valve, unless it be the pressure gauge. The valve, in thousands of instances, sticks fast, never being tested, and is of no earthly service. Usually the safety valve is more of a danger signal than anything else. Recently we had occasion to note this in regard to a boiler which we were inspecting. The safety valve was blowing off and had been for some time, but as it was desired to push the evaporation of the boiler considerably, the engineer opened the valve a little wider by raising the lever. In spite of this, however, the pressure rose some pounds, the valve not being able to discharge all the steam which the boiler was making. Recent explosions in a number of cities have disclosed the fact that even in manufacturing and other establishments using a large amount of power, gauges are neglected in a criminal manner, and we may expect that in time, as the steam-heating boilers begin to wear out, we may have destructive explosions of such apparatus. It is fortunate that in the Western States the sectional boilers have for many years been very largely used for all domestic steam heating. With these little trouble may be expected from explosions or over-pressure, because joints would open and the pressure be relieved before any damage could be done. Where shell boilers are introduced in order to make a cheaper apparatus, or for other reasons, we may expect that there will be an increase of the danger, and when boilers of this kind grow old there will be a crop of explosions until people learn that care and proper treatment is necessary.

ITEMS OF INTEREST.

FABER, the pencil man, gets the wood for his pencils from Cedar Keys, Florida.

A CONCENTRATED beam of electric light carried seven miles has furnished sufficient light to read by.

A NEW $10,000,000 construction company has been organized in Connecticut to build railroads in Mexico.

THERE are some 450 men, women, boys and girls employed in the manufacture of gold leaf in this country.

A monster English steam-plow has been set up at Minneapolis. The plow and machinery, complete, cost about $10,000.

THERE are not fewer than ten European countries which must buy a part of the grain they consume, and nearly as many are compelled to buy a part of their meat.

A PAPER watch has been exhibited by a Dresden watchmaker. The paper is prepared in such a manner as to render the watch as serviceable as those in general use.

CAPT. Farrow, of the Leadville Iron Works, has secured subscriptions to the extent of $40,000 for the new iron foundry and machine works to be erected in that city.

WITHIN the last decade, beef has been below $10.00, pork below $11.00, and flour below $5.00 per barrel; coffee below eleven, tea below thirty, and sugar below five cents per pound.

ELECTROTYPES of wood cuts are now advantageously made of nickel. The advantages over copper are hardness, toughness, non-liability to oxidation and its proportionately low price.

BY means of newly improved pumps it is possible to secure a vacuum so nearly perfect that a given space will contain no more than the hundredth-millionth of its normal quantity of air.

JOHN ROACH has over 2,000 men employed at Chester on thirteen vessels, representing an aggregate tonnage of 27,000 tons. Mr. Roach has built over one hundred vessels in eleven years, at a cost of $25,000,000.

SODA-ASH the principal chemical used in this country, in quantity of value is almost wholly imported. There was imported last year 295,227,766 pounds, or 137,613 tons, valued at $154,258.44. This article is used in glass, paper, soap making, for bleaching, and in various other industries.

TWENTY years ago the Cleveland Rolling Mill Company employed 250 men in the manufacture of merchant iron and iron rail, while to-day 6,000 men are employed in the making of steel rails, steel wire, steel boiler plate, steel shovels and other products that were formerly made of iron.

ONE of the most unjust of the shipping laws applies to the measurement of American vessels Tha present method takes in cabins, coal-bunkers machinery, forecastle, and the space reserved for stores and equipments. The British system only takes in the measurement of the cargo space or freight-carrying capacity.

A STEAMER has been chartered in New York to carry agricultural implements to Sevastopol, Russia. The cargo will consist of mowers, reapers, plows, trucks, grain drills, cutting machines, fan mills, corn huskers, saps, etc. One firm alone will ship ten car loads of Western made implements upon the steamer upon orders. The prices are said to be satisfactory, the Russian farmers preferring American implements to all others.

A CONSIDERABLE steel-making industry exists in China, on the Upper Yangtze, whence the steel is sent to Tientsin for shipment and distribution. It fetches much higher prices than the Swedish steel imported into the country. The Chinese metallurgists recognize three kinds of steel, namely, that which is produced by adding unwrought to wrought iron wnile the mass is subject to the action of fire; pure iron many times subject to fire, and native steel, which is produced in the southwest. The different names for steel are twangkang, or ball steel from its rounded form; kwankang, or sprinkled steel; weitee, or false steel. The Chinese apparently have known how to manufacture steel from the very earliest ages

SINCE 1849, the United States have added 95,000 miles to her railway system; half a million of tons to her inland marine, exported $14,000,000,000 to foreign countries, and her valuation has increased from $8,000,000,000 to $15,000,000,000.

THE *Textile Record*, of Philadelphia, Pa., published monthly by Messrs. Christie, Clark & Nagle, presents a vast body of valuable matter, industrial, inventive and commercial, in the important lines it represents. It is the leading organ for textiles in this country. It appears to command every source of information, home and foreign.

THE *Pittsburgh Railway Reporter*, an important contribution to railway jouanalism, has already been enlarged. With industry and ability in its staff, this journal also taps the best sources of information, and is evidently well backed by railway officials.

A THREE TRUCK freight car having been tried successfully on the Iron Mountain Railroad, the additional truck enabling a car to haul double its former capacity with very little increased motor power, a train of ten cars is to be put on the Chicago, Burlington & Quincy Railroad, fitted up three cars to a truck.

THE Biddell House, Bradford, Pa., is a popular resort of commercial travelers visiting that city, as, in addition to every ordinary comfort and convenience possessed by first class hotels, the proprietors, Charles Chamberlain & Co., have provided admirable sample rooms, and these on the first floor. As a mere illustration of the completeness of the appointments, it may be mentioned that electric call bells are in all the rooms. The hotel, under the present proprietorship, has been furnished and renovated throughout. Its position is all that can be desired, being nearest the depot and most convenient to all business points.

THE COMPOSITION OF STEEL FORGINGS.—At a recent meeting of the Newcastle-on-Tyne Chemical Society, Mr. T. W. Hogg read a paper on the "Variation in the Composition of Steel Forgings," which gave the results of a series of analyses made by him to ascertain if there is any difference in chemical composition between the central parts and the surrounding material of steel forgings. Samples of metal were taken from a forging 7¾ inches in diameter, and formed from an ingot of 3 tons in weight. These were submitted to analysis in the laboratory, great care being taken to obtain comparative results. The tests showed that impure metal was contained within a radius of 1½ inches from the center. The general conclusion from numerous other experiments is that those parts of a steel forging corresponding to the part near the top and bottom ends of an ingot are homogeneous in their composition, and those parts of the forging corresponding to the middle of the ingot contain a core of accumulation depending upon the size of ingot and the rate at which it cools.

FIRE-PROOF DOORS FOR MANUFACTORIES.—A dear-bought experience has shown iron to be absolutely unfit for fire-proof doors. The heat of a light fire will cause an iron door to sink by its own weight, while the writer has seen double "air space" doors, made of thin corrugated iron, shrivel like the withered leaves of Autumn, where the fire was insufficient to destroy the paint on them. The most efficient fire door is constructed of two thicknesses of tongued and grooved inch boards laid diagonally across each other, and nailed with wrought iron nails driven flush, and nailed on the other side. This door is then covered on sides and edges with sheets of tin locked together like a tin roof. The lintel should be tinned and securely fastened to the masonry. If a swinging door, the hinges should be securely bolted on, and not merely fastened with screws. The latch of such a door must be of substantial character, and the catch securely fastened. If a sliding door, cleats should be fastened securely on the floor each side of the doorway, to keep the door in position against any draft tending to swing it when shut. Doors of this construction, although exposed to many severe fires, have never been know to fail. The covering does not receive enough heat to be melted, and by protecting the inclosed wooden door from the air, its combustion is prevented, and an examination of such doors, after an exposure of several hours to the flames, shows that the wood has been slowly carbonized, the charcoal extending to a depth of only a fraction of an inch.

MINERAL WOOL.—Mineral wool is a product of the blast furnace, and is produced from molten slag, by allowing it to fall while in a fluid state upon a jet of steam or compressed air, the effect of which is to transform it into a fleecy mass resembling sheep's wool and cotton, but with no common or parallel direction of the fibrous threads. About 80 per cent. of it has to be riddled, which forms the ordinary grade, while the residue is separated by currents of air, and forms the extra grade. The process of manufacture is simple, and the produce is ready for immediate use. Being absolutely fire-proof, and an unequaled non-conductor of heat, there is hardly any limit to the extent to which it may be applied. No other material is so well adapted to protect water mains and feed-pipes from freezing; ice in refrigerators and ice-houses from melting; to insulate cold storage houses and brewers; prevent condensation of steam in boilers, cylinders and pipes; and the passage of heat through roofs, partitions and sidewalks; to deaden sound, and check the inroads of vermin and the spread of fire. It is also a most serviceable article for lining the floors of passenger cars, as a non-conductor of heat and sound, and as a check to the progress of fire. It is already used to a considerable extent for this purpose.—*National Car Builder.*

A New Motor.

Perhaps the smallest and for its size the most powerful electric motor yet invented is that known as the Griscom Motor, consisting of a small Siemens armature, or bobbin, revolving in the heart of a fixed electro-magnet, made in the form of a flat ring or soft iron wound crosswise with silk-covered copper wire. Two parts of the iron ring, on opposite sides, are left bare, and form the poles of the fixed magnet. The current, which is reversed at every revolution of the armature, is led to the bobbin by two pairs of small copper rollers mounted at the ends of light springs. The pole pieces of the bobbin are curved so as to be concentric with the curved poles of the ring, and they are fitted so as to pass very close to the latter. The current which passes through the bobbin also excites the fixed electro-magnet; and as the motion of the bobbin, which is itself a magnet, must excite induction currents in the coil of the ring surrounding it, the coil is so wound that these inducted currents go to help the exciting currents, and tend to increase the power of the electro-magnet. The current is derived from a bichromote of potash battery of six cells, and of a size exposing 100 square inches of zinc surface to the action of the exciting fluid in each cell. With this number of cells the motor is stated to perform 1,000 foot-pounds of work per minute. Its chief application at present consists in the driving of sewing machines, one of which may easily be worked at a speed of from 800 to 900 revolutions per minute. By raising or lowering the plates of the battery in the liquid the speed may be diminished or increased. An engine of the power as given above is capable of imparting a speed of 2,500 revolutions to a rotary fan, and, considering that the motor is only 2½ by 2 inches in size, and weighs but two and one-half pounds, it must be confessed that it is a wonderful little contrivance. The working cost is stated to slightly exceed two cents per horse-power, but the accuracy of this statement cannot be vouched for.

REVIEWS.

The Century Illustrated Monthly Magazine for May. NEW YORK: The Century Co., Union Square.

The May number of the Century is superb. It opens with an article entitled "The Canadian Mecca," abounding with sketches of French Canadian times and historic reminiscenses. The scenes depicted rivet attention. "Carlyle in Ireland" consists of the memoranda of that eccentric genius, no line of which will be missed by readers. The "Opera in New York" is continued. Among the illustrations is "Castle Garden in 1850." A life-like portrait is presented of Madame Sontag. The engaging story "Through One Administration" is continued. The article on the "Hellenic Age of Sculpture," with sculptural illustrations, possesses a vivid interest. "A Modern Instance," a story, becomes increasingly engaging. The "Street of the Hyacinth" is a Roman sketch. Altogether this magazine is a valuable compendium of amusement and instruction.

WHEN writing to advertisers mention this paper.

A SMOKELESS ENGINE.—A smokeless and sparkless engine, invented by Mr. R. L. Walker of Boston, has been tried on the Fitchburg railroad, the master mechanics of other roads centering in Boston accompanying it, and has proved a success. The average consumption of coal on a 20 mile trip was 1,000 pounds, an important saving in fuel.

COMPRESSION OF FLUID STEEL.—A method of compressing fluid steel, for the purpose of making absolutely sound ingots, consists in admitting steam at a high pressure on top of the mold as soon as the metal is poured.

TRANSMISSION OF MOTION.—A patent recently granted in Vienna and Berlin uses bands of steel, which is tempered and hardened, to transmit motion from one pulley to the other, the faces of the pulleys being turned perfectly flat and then faced with a varnish of rosin, shellac and asphalt.

MARKETS.

FINANCIAL.

Office of TRADE REVIEW AND WESTERN MACHINIST.

FRIDAY EVENING, April 28.

The demand for money, of which there is an ample supply, reserves showing an increase, is fair. Good business paper is in fair supply, and the bank rate is 7 to 8 per cent. to the general public. Call loans rate at 6 per cent. Notwithstanding anticipated labor troubles, the financial tone is healthy.

IRON.

Production of American Pig continues in excess of consumption, and supplies are beginning to accumulate at furnace banks. Purchases are strictly limited to immediate wants. In estimating the future course of prices, too much importance must not be attached to the lessening of the demand for equipments of new speculative railways; foundrymen look for a continuance of a fair amount of trade. There has been little done in Scotch Pig, and but limited arrivals. We quote: Coltness, $25½@26; Eglinton, $22.50@23.50; and Glengarnock and Carnbroe, $24@24.25. Steel rails are quiet at $54@58; lower prices than $54, it is said, have been taken; summer deliveries are firm at $56@$58. Old rails are irregular. Scrap is declining. We quote old car axles and car springs $37 to $40 per net ton; wrought turnings $22 to $24; old wheels $27 to 29, per gross ton; cast boring $15 to 16. Plate and tank is in active demand; large orders are in hand. Tank is quoted at 3c.; refined, 3¼@3¾c.; shell, 3¾@4c.; flange, 5c. For construction iron the demand is unabated.

CINCINNATI.—(Reported by Rogers, Brown & Co.) A little more activity is noticed in the iron market. Several considerable buyers have been forced to replenish their stocks during the week and their bidding for special prices has developed a feeling of greater firmness among furnacemen than was believed to exist. Three or four important sales were made within the limits of our quoted figures. The great body of buyers, however, still hold off, believing lower prices to be near at hand. Good Hanging Rock No. 1 charcoal iron is becoming somewhat scarce. The supply of silvery soft irons is also a little restricted. Strong Southern coke irons are at present the chief factor in the market, and with an increasing supply and improved character, they are likely to become so permanently. The demand for car wheel metal continues very light, but an improvement in this respect is looked for as soon as assured crop prospects give more activity to car building. The feeling in this district is that wheat is practically uninjured by the late frosts, and the only serious damage will be to early fruits. We quote for four months, Foundry, Hanging Rock, C. C., No 1, $28.00@$29.50; No. 2, $27.00@$28.50; Southern, No. 1, $27.00@28.00; Strong Coke, No. 1, $26.50@27.50; No. 2, $25.00@26.00; No. 3, $24.00@25.00; Soft Stone coal No. 1, $24.50@26.50; No. 2, $23.50@$24.50. Forge—Strong, Neutral, No. 1, Mill, strong, $23.00@$24.00; Cold Short, No. 1 Mill $22.00@23.50. Car Wheel and Malleable Hanging Rock Cold Blast, $35@37; Hanging Rock Warm Blast, $28@29; Southern Car Wheel Iron $35@37; Lake Superior, $32@34; Lake Superior Malleable, $32@$34.

CINCINNATI.—Reported by E. L. Harper & Co.—The business of the week has been active though confined principally to numerous small orders, though some large orders have been placed at shaded figures. The large buyers feel that little risk attends moderate purchases, and the timidity of last week is disappearing. The scarcity of Hanging Rock charcoal irons of best grades has strengthened their value. The indications favor a general activity in mercantile business, and all industries, and coupling with these indications the necessity of early purchases on the part of those withholding for lower figures, we will, in all likelihood, experience a stimulation of the Pig Iron market very early.

COPPER.

We quote Lake Ingot 18¼@18½; Baltimore & Arizona respectively 18@18¼c. Consumers are indisposed to pay more than 18c. for Lake. Negotiations which have been some time pending for the formation of a pool, have at last resulted in contracts having been closed with the mining companies for the sale of about 20,000,000 lbs. at 18 cents, delivery extending up to October 1st, the companies agreeing not to sell during this period at less than 18 cents.

LEAD.

The market is dull, and prices range from $4.95 @5.05c. for common, and 5.12½@5.15c. for refined, nominally.

SPELTER AND ZINC.

Spelter is quiet; we quote 5¾@5¾c. for Domestic and Silesian. The arrivals of foreign spelter are reported small. Sheet Zinc is firm at 7¼@7¼c.

TIN AND TIN PLATES.

Tin is depressed, the market following the decline in England. Values have ruled at 22@22¼c, with jobbing sales at the latter price. We quote round lots Banca 29c; Straits and Malacca 21@22¼c.; Billiton, 23c.; Australian 22½@23; English L & F 21c. The jobbing demand for tin plates has been moderate and prices are unchanged. The oil trade are reported to have bought 20,000 boxes cokes at $5 to $5.12½, spot and futures.

COAL.

There have been large arrivals of coal with liberal shipments. Prices are firm in view of anticipated labor troubles, as operators do not feel justified in putting up wages to their former figure. There is such a diversity of interests and conditions in Northern Ohio coal districts that it is believed that nothing like concerted action among the miners can be maintained. We quote for general charters Lake Michigan, 75c.; Detroit River ports, 40c.; Lake Superior, Marquette, Houghton, &c., 60@70c; Duluth $1.

HARDWARE.

The Hardware trade continues brisk. Prices are firm and without change. Mechanics' tools are in active request. Orders for agricultural implements are coming in freely. Spikes, cars, nuts and bolts are in steady demand in small lots. There is a good business in nails, the terms being 3.40, 60 days, with an abatement of 10 cents per keg on carload lots and upward; and 2 per cent. off for cash. The demand for barb wire is increasing, and the outlook is very satisfactory. C. E. Jennings & Co., 96 Chamber street, New York, will henceforth have the exclusive sale of Hayden's Screw Wrench. The Providence Tool Company is about to summon its creditors and endeavor to come to some arrangement by which the works may be continued. Besides gunmaking, it engaged in hardware specialties. The manufacturers of Strap and T hinges have affirmed existing prices. We have no changes in values to announce.

LUMBER.

Orders at the yards are setting in steadily. Next month however, will witness a large contribution to the filling up of depleted stocks. There is a demand for dry stock, and large dimension is in request. The activity of building stimulates the demand. Hard woods of all descriptions hold their position well.

WOOL.

The eastern wool markets rule steady, and purchases are made carefully. Ohio fine delaine has brought 47c; Ohio X, 42½@43½c.; Ohio XX 45c; No. 1 Ohio 43@46c.

LUMBER.

PLANK, MIXED WIDTHS.
2 inch, 12, 14 and 16 feet, together.

A 1 and 2	$50
A 3	40
B	32
C	22
D	16
E	13

1¼ and 1½ inch.

A 1 and 2	$48
A 3	40
B select	32
C	22
D	16
E	13

BOARDS.
One Inch, mixed widths.

A 1 and 2 uppers	$44
A 3	36
B select	30
C	22
D	16
E	13

STOCK BOARDS.
12 Inches wide.

A 1 and 2	$45
A 3	38
B	32
C	24
D	16

STRIPS.
6 Inches wide.

A 1 and 2	$42
B	35
C	25
D	18
E	14
Norway Fencing Strips	18
Norway Flooring Strips	25

WORKED LUMBER
FLOORING.

Flooring—A 3	$42
B	38
C	24
D	20
Norway Flooring—A 3	28
C	22
D	18
Matched Drop Siding, 6 inches—A 3	42
B	38
C	24
D	20

Beaded Ceiling $2 higher than Flooring.

One half inch Bevel Siding—A 1 and 2	24
A 3	20
B	18
Ash Flooring—A 1 and 2	40

BILL STUFF.

Small, joists, 12, 14 and 16 feet	$16
18 feet and under	$17
Timber, larger than 8x8 special.	
Timber, longer than 18 feet, adds about $1 per foot per M. extra.	
Cedar Posts, large	30 00
" " medium	25 00
" " small	$15 to 20 00

SHINGLES, LATH AND MILL WORK

Shingles XXX	$4 50
Clear Butts	3 50
Lath	3 00

Surfacing, one side, adds $1.50; two sides $2.
Matching flooring and drop siding, $2 50.

Excursion to Colorado.

The Pennsylvania Company and Pan-Handle Route will place on sale, May 1st, at all their principal stations, Round Trip Excursion Tickets to Denver, Pueblo, and Colorado Resorts.

Guide Books and Pamphlets, giving routes of tickets, rates of fare, and general information, will be furnished free on application, in person or by letter, to

E. A. FORD,
General Passenger Agent,
Pittsburgh, Pa.

FOR SALE.
Heavy Punch or Shears.
Used for punching Railroad Fish Plates. Punches four holes at a time. Weight over Five tons. Good as new. Address
NATIONAL MACHINERY CO.
Cor. Superior and Bond Streets.

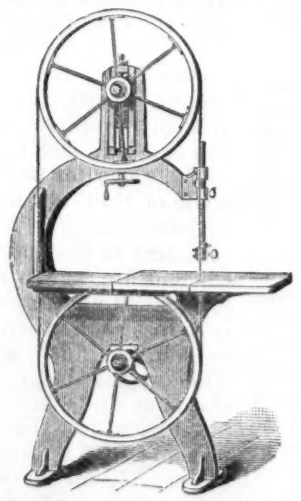
JOHN SHAW & CO.,
Brass Founders,
Manufacturers of
All Kinds of Brass & Metal Castings
FOR PATTERNS, &C.
92 St. Clair Street, TOLEDO, O.

W. L. COTTRELL & CO.,
PATTERN AND MODEL MAKERS.
Personal attention given to all work, and satisfaction guaranteed.
53 Centre Street, Cleveland, O.
Correspondence solicited.
W. L. COTTRELL. S. T. JULL.

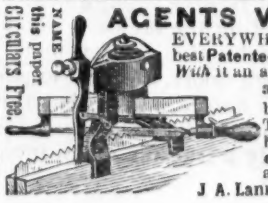
$$$$$ SAVED! $$$$$
Twenty-nine Hundred Seventy-seven
2977 MACHINES 2977
NEW & SECOND-HAND
comprising
Machine and Blacksmith Tools of every description. Woodworking Machinery in all its Branches, Portable Engines, Upright and Horizontal Stationary Engines, 1 to 300 horse power, Locomotive Fire-box, Horizontal and Upright Boilers, 1 to 100 horse power, Waterwheels, Cotton and Woolen Machinery, Steam Pumps, Grist Mill Machinery, &c., &c., &c.
S. C. F. & CO.
Fully described, with prices annexed, in our List 28. Send stamp for same, stating what you want.
We have the largest assortment of Machinery to be found in the hands of any firm in the country.
Works and Main Office,
Manchester, N. H.
S. C. FORSAITH & CO.
Branch Office and Warerooms, 209 Center Street, New York.

THE MILLER CO.
Manufacturers of
THE TORRENT AND UNIQUE INDEPENDENT BOILER FEED
Steam Pumps,
Canton, Ohio.
For Boilers of from 5 to 150 H.P., with Base, or Bracket on smaller sizes! Price $30 and upwards. Small sizes indispensable for Farm and traction engines. Also make a specialty of all kinds of castings. Send for new 1882 Catalogue.

Eureka Band Saw.



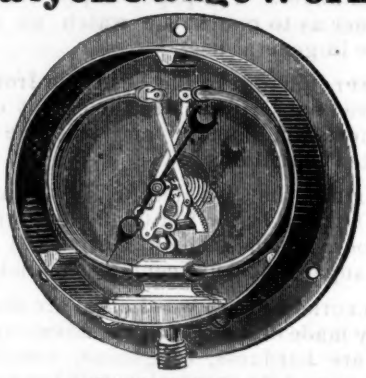
We build three sizes of this machine
with 26, 30 and 38 inch wheels.
The two smaller sizes will saw hard wood 12 in. thick, the largest 16 in. thick. They are made of the best material and are well made.
For further information address
FRANK & CO.,
Manufacturers of
WOOD WORKING MACHINERY,
176 Terrace Street, BUFFALO, N. Y.



AGENTS WANTED
EVERYWHERE to sell the best Patented Saw Filer made. *With* it an apprentice can file a Saw as well as the best expert *without*. They sell on their MERITS. Secure exclusive territory and BIG Profits.
J. A. Lannert, Cleveland, O.

FOR SALE.
One 15-H.P., mounted Threshing Machine.
One 10-H.P. Threshing Machine.
One 8-Horse Power.
Address
NATIONAL MACHINERY CO.
Cor. Bond & Superior Streets, Cleveland, O.

DatyonGaugeWorks



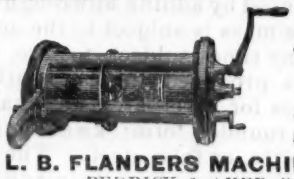
Patented Feb. 5, .
O. W. BAYLEY Prop.
Manufacturer of the
Bourdon and Ashcroft Gauge,
ALSO, BAYLEY'S
IMPROVED DUPLEX GAUGE,
Specially adapted for Locomotives.
32 North Jefferson Street,
DAYTON, OHIO.
All kinds of Gauges repaired at short notice

A. & F. POWELL'S
TOLEDO WIRE WORKS,
Manufacturers of
Wire Counter Railing,
Plant Stands, Settees,
Chairs, Wire and Iron Fencing.
238 Summit Street, TOLEDO, O.

HOLLAND & THOMPSON
Troy, New York,
Manufacturers of the
Holland Lubricator,
for lubricating the Valves & Cylinders of Steam Engines.
Operating with downward visible drop. The principle of this Lubricant is entirely new; being the only one manufactured operating with a downward visible drop, and does not conflict with any other patented Lubricator, being protected with Letters Patent, granted July 5, 1881.
A saving of from 50 to 90 per cent in cost of oils. Send for Circular.

M. GAUNT,
Manufacturer of
AUGERS AND MACHINE BITS,
All goods manufactured at my establishment are guaranted A1.
Factory—22 East South Street.
INDIANAPOLIS, IND.

Portable Crank Pin Machine.



For turning off crank pins in position and while wheels are under engine.
L. B. FLANDERS MACHINE WORKS,
PEDRICK & AYER, PROP'RS,
1025 Hamilton Street, Philadelphia, Pa.
New Descriptive Circular on application.

Cleveland Wholesale Prices.

HARDWARE.

Adzes.

Carpenter's.....per doz	$16 80
Ship..... " "	18 75
Heavy railroad.... " "	19 50

Axes.

Hunt's.....₱ doz	$ 9 50
Lippincott's Crown ₱ doz	9 00
Cut More ₱ doz	9 00
Peck's Double Bit ₱ doz	22 00
" Champion Blade ₱ doz	11 00

Anvils.

Eagle, Amer...per lb.	10c dis 15
Wright's	11½c@12c
Armitage's Mouse Hole	9½@9¾c
Trenton	10½c
Wilkinson's	10c

Animal Pokers.

Berea, per doz	4 00
Eagle, per doz	5 00

Apple Parers.

Domestic & Reading ₱ doz	$7 50
Turn Table	6 00

Cleveland Stamped Elbows

Genuine Russia Iron

4 inch per doz	4 50
4½ do do	5 50
5 do do	7 50
5½ do do	8 50
6 do do	9 50
7 do do	11 00

Planished American Russia Iron

4 inch, per doz	4 00
4½ do do	5 00
5 do do	6 50
5½ do do	7 50
6 do do	8 50
7 do do	9 50

Charcoal Iron

4 inch, per doz	2 00
½ do do	2 50
5 do do	3 50
5½ do do	4 00
6 do do	4 50
7 do do	5 50

25 per cent

Augurs and Bits. Dis

C S cut augurs	40@10
do do do bits	40@10
D C gimlet do	$6.00 Gross
Snells	@40
Russell Jennings'	10 10@10
Cook's pat augur	40@10@50
Post hole, net ₱ doz	$21@24

Balances. Dis

Fairbanstillon's, Frary's, Morton's	15
10 per ct	

Bellows. Dis

Blacksmith's com new list, 40	₱ct
Moulder's new list, dis 40	₱ cent
Hand, new list, 40 per cent	

Bolts. Dis

Carriage and tire, com	80
do do Norway	65
Stove	40
Plow	30
Wagon	40
Machine & Square head	55
Skein,	55
Bolt ends,	55
Lag,	55
Tap,	55

Butts. Dis

Wrought brass	65&10
Cast, loose joint	50&10
Pin, japanned and silver tipped	45&10
Wrought, fast joint narrow	40&10
Vrought fast joint broad	45&10
Wrought loose joint broad	45&10
Vrought table and back flaps	40&10
Loose joint, reversible	45&10
Brass kettles—per lb	32@35

Chains.

Coil by cask,

3-16	¼	5-16	⅜	7-16	½
10½	9	8	7	6½	6¼

Crucibles.

Per number	4@ 4½

Clothes Wringers

Keystone per doz	42@45

Chisels.

Hot and cold cutting ₱ lb	$ 30
Railroad track	30
Machinists	30
Chipping, mallet head	50
Cape	50
Packing	50
Stone cutters	50

Crowbars.

Steel point ₱ lb	5½
Cast steel	7¼

Cutlery, Pocket and Table.

Meriden Cutlery Co, table	net
Am. Miller Bros.' Cutlery Co	dis 25
Humason & Beckley, pocket	33⅓
Naugatuck Cutlery Co	list net
Aaron Berkenshaw's d pocket	is 25

Drills and Drill Stocks.

Blacksmiths', each	$2.50 dis 10
Blacksmiths', self-feeding, each	7.50 dis 20
Breast, P. S. & W	dis 20&10

Drawing Knives.

Discount.

Witherby's	60@10 ₱ cent
Barton's	15
Adjustable handle	10

Emery.

Genuine Chester	7@ 8
Wellington	10@12

Files.

Auburn	$5 to £. dis 35 pr cent
E. M. Boynton's, new list	dis 25
J. & Riley Carr	4.50 to £
Johnson & Bro.	dis 30
Butcher's	4.50 to £.
Walter Spencer & Co.'s " Diamond"	4.50 to £.
Fisher's	4.75 to £
Moss & Gamb'e	4.50 to £
H. Disston & Sons (new list)	dis 40 per cent
Heller Bros.' Horse Rasps	dis 25
Nicholson	dis 40
New American	dis 40
Union File Co	dis 40

Grindstones.

Ohio	1¼@1½ ₱lb
Nova Scotia	1½@1¾ ₱lb

Hatchets.

Yerkes & Plumb:--Shingling,

Nos. 1, 2, 3,

₱ doz $7 50, $8 00, $8 50, dis 25

Claw,

Nos. 1, 2, 3,

₱ doz $8 25, $8 75, $9 25, dis 25

Lathing,

Nos. 1, 2, 3,

₱ doz $7 50, $8 00, $8 50, dis 25

Horse Rasps.

Heller's	dis per cent 30
"Arcade"	50 & 20

Harrow Teeth.

Iron ⅝ to 1 inch	per lb 3¼c
Steel, square	4¼c

Hammers.

Mason's stone hammers, steel faced and pene	₱ lb 15
Mason's stone hammers, solid cast steel	25
B. S. Napping hammers	30
Striking hammers, solid cast steel, 5 to 25 lb	20
Drilling hammers, solid cast steel, 3 to 6 lb	20
Turning hammers, full polished	each 2 00
Set hammers	₱ lb 35
Creasing hammers	35
Ordinary bush hammers	55

Nails.--BRADS AND FENCE.

10 to 60d	3 40
8 and 9d advance	25
6 and 7d do	50
4 and 5d	75
3d	1 50
2d	2 75
3d fine	3 00
2d fine	3 75
⅝ inch	3 00
4d barrel	1 00
1¼ inch barrel nails	1 50
1¼ do do do	1 75
1 do do do	2 50
⅞ do do do	3 00
Cut spikes, all sizes	25
Clinch nails, all sizes	1 75
Casing and box nails 75 cts advance	
Finishing nails, $1 25 do	
Tobacco nails, 50 cts do	

Nuts and Washers Dis

Nuts	7
Washers	6

Picks.

Railroad, 4 to 5 lbs	doz $7 75
5 to 6 lbs	7 75
to 7 lbs	8 50
7 to 8 lbs	9 50
Railroad Tamping Pick 7 to 8 lbs	doz 13 50
Mill Picks per lb	75c

Rivets.

Iron	dis 40
Tinned	dis 40
Copper	dis 33⅓

Squares. Dis

Steel or iron, case lots	50
Try squares and T bevels	40

Spikes—WROUGHT

All lengths by ¼ inch	4½c
do do do 5-16	3½
do do do ⅜, 7-16 & ½in	3¼

Shovels and Spades.

Ames' new list, July 1, 1881,	dis 15
Old Colony	dis 15
Remington's (Lowman's Patent)	dis 30
Rowland's	dis 40 and 10
Griffiths	dis 40&10

Shovels and Tongs.

Iron and Brass Head, R. & E. list	dis 60&2
Polished Steel, new list	dis 50&10&2

Sad Irons.

From 4 to 10 lbs	per lb 3½ net
Self-Heating	₱ doz $9 net
" Tailors	₱ doz $18 net
Gleason's Shield and Toilet	dis 25
Mrs. Pott's Irons, double pointed	dis 40
Mrs. Pott's Irons, square back	45 dis
Enterprise Star Irons	45 dis
Comoined Fluted and Sad Iron	₱ doz $15, dis 15

Saw Sets.

Boynton s patent X Cut, per doz $12; Hand Saw, per doz $10.	dis 20
Stillman's Genuine, per doz $3 50 and $5 50	dis 10
Stillman's Imitation, per doz $3 25	dis 20&10
Common Lever, per doz $2	dis 30&10
Leach's No. 0 $3; No. 1 $15;	dis 15
Hammer, Hotchkiss $5 50, dis 10	
" Bemis & Call Co.'s new patent	dis 40&5
Bemis & Call Co.'s Lever and Spring Hammer	dis 30&5
Bemis & Call Co.'s Plate	dis 10
" " Cross-cut	dis 12½
Aiken's Genuine...$13,	dis 50&10
" Imitation	$7, dis 50
Hart's Patent Lever	dis 20
Disston's Circular	dis 40

Bag Holders.

Sprengle's Pat, $18.00 per doz 40 per cent. dis.

Planes.

Ohio Tool Co	dis 20
Sciota	dis 25
Bailey's Pat. Adjustable	dis 25

Rules.

Stanley	dis 66⅔ and 10

Sash Locks. Discount.

Payson Mnfg. Co. "Perfect"	42
Simmons' Sash Supporters	20

Hinges.

Champion double acting spring hinges	dis. 30
Screw & Strap 8@12 in.	$6. net
Gravity Locking Blind Hinges, Sargeant & Co.	70&10

Screws. Dis

Flat head iron or steel per cent dis.	30
Flat head brass	30
Round head iron or steel	25
Round head brass	20
Brass and Silver capped	40
Japanned, list of Plain Screws	20
Coach, patent Gimlet point, list per 100	60
Lag, taper points	60
Bed	10
Machine, flat head, iron	55
round head, iron	50
Bench, iron	55&10
wood, beech, per doz $3	10
wood, hickory	20&10

Scales. Dis

Fairbanks'	25

Tank Iron.

3-16, ¼ and ⅝ inch thick	3 20

Tacks. Dis

Black	30—10
Tin'd	55—10

Traps. Dis

New House	30
Peck, Stow & Co	50—10

Vises.

Solid box, Dis	40

Wrenches.

Coe's genuine	40 & 10
Coe's imitation wrought bar	40
Mechanics'	60 and 10

Wire.

Brass and Copper	dis 20
Bright & annealed, Nos. 0 @ 18	dis 50@52½
" " Nos. 19 @ 26	dis 6
" " Nos. 27 @ 36	dis 65
Coppered Nos. 0 @ 18,	dis 45
Galvanized, Nos. 0 @ 18, market list,	dis 40@45
Tinned, Nos. 0 @ 18,	dis 40@45
Cast steel	dis 40
Tinned Broom Wire, Nos. 18 @ 25	dis 55
Annealed Fence, Nos. 8 and 9	dis 55@52½
Annealed Grape, Nos. 10 to 14	dis 52½
Galvanized Telegraph, Nos. 7 to 9	₱ lb 7½c
Galvanized Telegraph, Nos. 10 to 11	₱ lb 8¼c
Galvanized Telegraph, No 12	₱ lb 10½c
Fence staples	₱ lb 5½@5¾c
Fence Staples, galvanized,	₱ lb 7@7½c
Stubs Steel Wire	$7 00 to £
Barb Wire, painted	8½c
Barb Wire, galvanized	9½c
Crucible Steel Ropes from ⅜ in. at 9c to 1¼ in. at	52c
Best Selected Iron Ropes from 3-16 in. at 8c. to 1¼ in. at	33c

Boiler Plates.

("Gaylord"--Standard Quality.)

C No. 1	1 50
C H No. 1 Shell	4 60
C H No. 1, 50,000	5 00
C H. No. 1, 55,000	5 50
C H No. 1 Flange	6 00
Firebox	
T S., 60,000 (as per)	6 00
T S., 65,000 (act of)	
Homo. Steel, 70,000 (of Cong)	8 00
Heads, ½c ₱ lb extra	

N.B.—Eastern brands of boiler plate at from 2-10 to 3-10c ₱ lb less than above prices.

Boiler Rivets—" Albany "

½, ⅝, 11-16, and ¾ in. diam.	5 50

Sheet and Tank Rivets. "Norway."

All sizes	dis. 15

Nuts, Bolts, etc.

Square & Hex. Nuts	7 off list
Washers	6 off list
Machine Bolts	dis 55
Bolt Ends	dis 55
Boiler Patch Bolts	net list

Boiler Tubes.

"National" Standard Gauge 1 inch to 10 inch	dis 37½
"National" Standard Gauge 11 inch to 15 inch	dis 25
"National" Special Locomotive Tubes	net list

Boiler Makers' Tools.

Doty's Power Shears	net list
" Hand Lever Shears	net list
" Power Punch	net list
" Hand Punch	net list
Steel Screw Punch	net list
Iron Screw Punch	net list
Boiler Plate Rolls	net list
Buffalo Forges & Blowers	dis 20
Watson's " "	net list
Spring Tube Expander	dis 15
Roller Tube Expander	net list
National Tube Cleaner	dis 20
Wire Flue Brushes	net list
Anvils—"PeterWright"	12½ ₱ lb
Solid Box Vises	net list

IRON AND STEEL.

Flat Bar.

1¼ to 4 by ⅜ to 1 inch	2 70
4¼ to 6 by ⅜ to 1 inch	2 80
1¾ to 6 by 1¼ to 1¾ inch	3 15
1¼ & 1¾ by ⅜ to ¾	2 80
1 & 1¼ by ½ to ¾	2 90
⅝ ¾ and ⅞ by ⅜ to ¾	3 15

Round,

1 to 1⅞ inch	2 70
2 to 2¾	2 90
2¾ to 3¼	3 20
3¾ to 4	3 70
4¼ to 4⅝	4 20
4¾ to 5	4 40

Square.

1 to 1⅞ inch	2 70
2 to 2¾	2 90
2¾ to 3¼	3 20
3¾ to 4	3 70
¾ to ⅞	2 80

Heavy Band.

1¾ to 6 by ¼ and 5-16 inch	2 90
1 to 1¾ by ¼ and 5-16 do	2 95
⅝ to ⅞ by ¼ and 5-16 do	3 00
⅝ to ⅞ by ¼ and 5-16 do	3 80

Half Oval and Half Round.

Wagon box iron ⅝ and ¾.. 3 95

1-10c per lb extra will be charged for cutting to specified lengths

Light Band.

1¾ to 2¾ by ¼ to 3-16	3 25

Hoops.

1¾ to 2, Nos 16 to 18	3 90
2¼ to 3½ do 13 to 15	3 80

1-10 extra for each gauge lighter

Sheet Iron.

No 22 to 24	4 50
No 25 to 26	4 30 offd. 4 50 asked
No 27	4 90
No 28	4 85

English Steel.

Best cast	₱ lb 15½c
Extra cast	16½c
Round machinery, cast	1ec
Swaged, cast	18c
Best double shear	15½c
Blister, 1st quality	13c
Refined tool steel	16½c
Spring calking	7¼@7½c
German steel, best	11c
2d quality	10c
3d quality	9c
Sheet cast steel, 1st quality	15½c
2d quality	14½c
3d quality	12½c

American Steel.

Best brands of refined cast steel	12c
Crucible machinery	8c
Open hearth ditto	5c
Hammer cast steel	9½c
Spring cast steel	7½c
Bessemer and open-h arth spring	5½c
Ditto plow	5½c
Steel boiler plate	6½@7c
Bessemer mach nery	5 @6c
Spring and calking	7½@7½c
Tire	4 @4½c
Sleigh shoes	3½@3¾c

Bessemer Steel Tire.

⅝ to 1 by 3-32	4½ ₱ lb
⅝ to 1 by ½ to 5-32	4½ ₱ lb
⅝ to 1 by 3-16 to ⅝	4½ ₱ lb

Miscellaneous Cast Steel.

Auger and auger bit	7
Axle steel for wagons	7½
Frog points and plates	7½
Frog size bars	7½
Pick, plain	8¼
Pick, and Mattock, beveled	8
Skate steel	8½
Table cutlery	8½
Trap spring steel	9
Pike and cant hoo	8½
Coal and granite	8½

TINNER'S STOCK.

Tin Plate,

10x14 IC charcoal	$8 25
do IX do	8 25
12x12 IC do	6 00
do IX do	8 50
14x20 IC do	6 50
do IX do	$6 25@7 50
DC, 12½x17 do	6 00
DX 12½x17 do	8 00

For each additional X add 2 00

IC 10x14 } coke	$5 75@5 50
IC 14x20 }	
IC 12x12 do	6 00@5 75

Tin.

Banca	per lb. 28c
Straits	" 25c
English	" 25c
Spot Tin	" 25c

Solder.

½ and ½	16½c
Extra	15½c
No. 1	13½c

Pat Planished Sheet Iron.

(A)	per lb 10½c
(B)	9½c

Nos	10	15	21	25
	to 14	20	24 & 26	
Com	3-60	3-80	4-00	4-20
Char	5-60	5-60	6-00	6-20

Sheets over 28 in. wide ¼c extra

Sheet Iron.

Galvanized, No	10 to 20	₱ lb	8½ a7 ¼
do	do 22 to 24		9 a8
do	do 25 to 26	10	a8½
do	do 27	10½	a9
do	do 28	11½	a9½
	dis, 40		
Russia Iron			12½@12c
American Cold Rolled			5@7½

Zinc.

Sheet, cask	7½@ 7¾
Sheet, open	8@ 8½

Tinners' Tools & Machines.

Machines (P. S. & W.) list add 20

Tools (P. S. & W.) add 6

LEAD.

American, ₱ lb	5½c
Bar, ₱ lb	6½c net
Pipe, ₱ lb	7½c dis 10 per ct
Sheet ₱ lb	8c dis 10 per ct
Tin-lined pipe ₱ lb	15c dis 10 pr ct
Shot Drop 7c; Buck	8c
Chilled Shot	8c

COPPER.

Lake Ingot	18¼@18¾c
Baltimore	18c
Arizona	18¾c

Sheathing Braziers Copper, Bolts, &c.

Brazier's Copper, ordinary sizes, 16 oz. per sq. foot, and over per lb	30c
Brazier's Copper, ordinary sizes, under 16 oz. and over 12 oz. per sq foot, per lb.	32c
Brazier's Copper, 10 oz. and 12 oz per sq ft. per lb.	34c
Brazier's Copper lighter than 10 oz per sq ft per lb	36c
Circles less than 84 inches in diameter per lb.	33c
Circles 84 inches in diameter and over per lb.	30c
Segment and Pattern sheets per lb.	33c
Locomotive Fire Box sheets per lb.	30c
Sheathing Copper, over 12 oz per sq. ft. per lb.	28c
Bolt Copper per lb	30c
Copper Bottoms per lb	31@32c

No copper is Sheathing except 14x10 inches, and not to exceed 34 oz. to the sq. ft.

Tinning.

14x18 per sheet	6c

All other size sheets, 2½c per square foot For tinning both sides, double the above amount.

SCRAP IRON AND OLD METAL

DEALER'S SELLING PRICES.

	Net Tons.
No. 1 wrought scrap	$24
Sheet and hoop "	10@11
Cast scrap, (No. 1 heavy)	19
Cast Scrap (Stove Plate)	12

OLD METALS.

Old copper per lb	15c
No. 1 H. Brass per lb	14
Heavy yellow Brass do	12
Light Brass per lb	12
Scrap Zinc per lb	6
Tea Lead per lb	3
Heavy Lead per lb	4

BRASS.

Cash prices for Roll and Sheet Brass For less quantity than 100 lbs. add 3c per lb

High Brass

All Nos not thinner than 10 No 28 wider than 2 in. not wider than 14 inch	30c
All Nos to No. 28, inclusive, and widths over 14 to 20 in. inclusive	35c
All Nos to No 28, inclusive, and widths over 20 to 30 in. inclusive	38c

½c per lb. advance on each No above Nos. 28 to 38, inclusive.

All Brass thinner than No. 8 is Platers' Brass at	53c

Sheets 24x48, and all sheets cut to particular sizes and lengths under 30 inches, in width wider than 2 inches 37c

Low Brass.

4c per lb. more than High Brass.

Gilding metal 8c per lb. more than High Brass	
Platers' or Gold Metal In Bars	48c
Sawed	51c
Planed or Polished	54c

For Slitting.

Metal in width in. to ⅛ in. to No 28, inclusive, 1c per lb advance

Metal, in width 2 in. to 1 in., thinner than No. 28, 2c per lb. advance.

Metal, in width ⅛ in. to ½ in. thinner than No. 28, 5c per lb. advance.

Metal ⅛ in in width and less, 10c per lb. advance.

Any of the above widths cut to particular lengths, add 7c per pound.

PIPE, WROUGHT.

Standard Wrought Iron Lap Welded Steam and Gas Pipe.

Inside Diameter. Inches.	Plain, Price Per Foot.	Galvan. or Enameled Per Foot.	Outside Diameter Inches.	Weight Per Foot.
⅛..	08		.40	.24
¼..	08	$0 11	.54	.42
⅜..	09	12	.67	.56
½..	11	15	.84	.85
¾..	13½	19	1.05	1.13
1 ..	19	28	1.31	1.67
1¼..	27	40	1.66	2.26
1½..	33	47	1.90	2.69
2 ..	46	64	2.37	3.66
2½..	75	1 00	2.87	5.77
3 ..	95	1 30	3.50	7.55
3½..	1 25	1 70	4 00	9.05
4 ..	1 50	2 05	4.50	10.73
4½..	1 75	2 40	5.00	12.49
5 ..	2 25	3 00	5.56	14.56
6 ..	2 75	4 00	6.62	18.76
7 ..	3 75	....	7.62	23.00
8 ..	4 75	....	8.62	28.00
9 ..	6 50	....	9 68	34.40
10 ..	8 00	....	10.75	40.64
12 ..	12 00	....		54.65

Discount, plain, 55 per cent; galvanized, 52½ per cent.

Gas and Steam Fitters' and Machinists' Supplies.

Gas and Steam Pipe—See Pipe Wrought.

Enameled Pipe	dis 65
Artesian Well Casing	net list
Hydraulic Tubes	net list
Malleable Iron Fittings	net list
Cast Iron Fittings	dis. 55
Globe Valves	dis. 50
Angle Valves	dis. 45
Check Valves	dis. 45
Safety Valves	dis 45
Eddy Gate Valves	dis. 20
Steam Cocks	dis. 45
Service Cocks	dis. 45
Ball Gauge Cocks (net per dozen)	$15
Compression Gauge Cocks	dis. 45
Miss. Gauge Cocks	dis. 45
Register Gauge Cocks (net per dozen)	$15
Cylinder Cocks	dis. 45
Air Cocks (net per dozen)	$2 75
Oil Cups	dis. 45
Steam Gauges	dis. 35
Water Gauges	dis. 45
Scotch Glass Tubes	dis. 60
Steam Whistles	dis. 45
Iron Body Globe Valves	dis. 55
Iron Body Safety Valves	dis. 55
Iron Body Steam Cocks	dis. 55
Pipe Tools	special
Globe, Angle and Check Valves (Powell's regrinding)	dis. 45
Guarantee "Jet Pumps"	dis 40
Mack's Injectors	dis. 25

Babbitt Metal.

N. P. U.	₱ lb @9c

A. 28c., B. 25c., C. 15c.

COAL,

WHOLESALE.

Wholesale f.o.b vessel at Cleveland:

Carbon Hill and Monday Creek	$2 65
Massillon	2 85
Brier Hill	3 50@3 75
Pittsburgh	3 00
Salineville	2 50
Tuscarawas	2 25

RETAIL.—Delivered.

Massillon Lump	$4 00
" Nut	3 75
Carbon Hill and Monday Creek, lump	3 75
Carbon Hill and Monday Creek, nut	3 50

75c less on cars by car load.

Anthracite Stove and Chestnut	7 15
Egg and grate	6 00

Hides and Leather.

Prime cured hides,	7¼@7¾
Green hides	6@6½

Bull, scrubby, badly scored or damaged, cured, two-thirds price.

Prime dry hides	13@14
Horse hides, green	$1 75@2 00
Horse hides, dry	$2 00@2 25
Prime cured veal calf	12½
Prime Deacon Skins, salted	60c
Pelts, wool on	32@34
Fresh slaughter sheep	30@$1 50
Fresh slaughter lambs	50@60
Green calf skins	13
Hemlock rough	23@24
Oak rough	25@26
Oak sole	37@40
Union harness	32@35

GLASS.

(Per box of 50 feet)

SINGLE THICKNESS

6x8 to 10x15	7 50
11x14 to 15x24	8 50
16x24 to 20x28	9 75
15x34 to 24x30	10 75
26x28 to 24x36	11 50
26x36 to 26x44	13
26x46 to 30x50	14 00

DOUBLE THICKNESS

6x8 to 10x15	11 7
11x14 to 15x24	13 25
16x24 to 20x28	15 75
15x34 to 24x30	17 25
26x28 to 24x36	18 50
26x36 to 26x44	21 25
30x50	22 50
30x52 to 30x54	23 25
30x56 to 34x56	25 00
34x58 to 34x60	27 75
36x60 to 40x60	30 00

Dis 60 & 15 single, 60 & 20 double

OILS & AXLE GREASE

Pure Oils. packages included

Sperm, winter bleached per gal	@1 15
Elephant, winter bleached, per gal	@ 70
Whale, winter bleached per gal	60@ 65
Seal, winter bleached	80@ 85
Bank oil	48 @ 51
Straits	50 @ 53
"A" oil for tanner's use	35 @ 40
Lard oil extra W S	90 @ 95
do No 1 do	76 @ 79
do No 2 do	63 @ 66
Tallow oil	65 @ 72
Neatsfoot oil pure	1 05
do No 1	90
Linseed oil, raw	@ 60
Linseed oil boiled	63
Cotton seed oil white	64 @ 66
do do yellow	60 @ 63
Carbon oil Ohio legal test	9½@11½
West Virginia lubricating 28 deg	@ 29
Pure Mecca	55@ 50
Paraffine oil winter pressed grav 25	
do do do	25@ 30
Machinery	40
Engine	50
Miners' oil	40@45
Drilling oil	40

Cleveland Business Directory.

Assayers and Analytical Chemists.

JUDSON, W, E, Ana ytical Chemist, 8 Cushing Block.

Bolt and Nut Works.

HOTCHKISS & GAYLORD, manuf'rs. Machine, Plow & Elevator Bolts, Coach Screws.

Boiler Makers.

SMITH & TEACHOUT — (Established 1857.) Boiler, Tanks, Stills etc. 439 Broadway.

Bridge Builders.

BUCKEYE BRIDGE AND BOILER WORKS mfrs of Arch & Truss Bridges, Boiler Tanks and Oil Stills. Bet. Wasson St. and Case Ave.

Coal and Iron Exchange.

JACKSON IRON CO. Iron Ore and Pig Iron. Rooms 8 and 9. Fayette Brown, Gen. Agent.

RHODES & CO. Coal, Iron Ore an Pig Iron. Rooms 1 and 2.

Carriage Blacksmith.

STRIEBEL, CHAS. manfac'r. of Carriages and Wagons and platform trucks. Horse shoeing and general blacksmithing ,93 Woodland ave.

Carriage Bolts.

THE COLWELL & COLLINS NORWAY BOLT CO., manufacturers of Philadelphia Carriage and Tire Bolts.

Church and School Furnture.

FAULHABER, GEO. manufacturer of School and Church Furniture. Fine Hard Wood work a specialty. 208 Ontario Street.

Custom Boots and Shoes.

ROONEY, JOHN manufacturer of hand-made Boots & Shoes, custom made and warranted 117 Ontario Street.

Carriage Repository.

GREENE'S, J. O., Carriage Repository, 408 Superior street and 52, 54 & 56 Rockwell street, dealer in Fine Carriages. Repair shop in connection.

SLATER. G. A., Carriage dealer, sells the best work for the lowest price. A fine assortment always on hand. Repository 365 Euclid Avenue

Coal and Pig Iron.

ANDREWS, HITCHCOCK & CO., Briar Hill Coal and Pig Iron. 122 Water Street.

Distillers.

BLOCH, S. H. & E., Distillers, and wholesale dealers in Kentucky Whiskies. 66 Water St.

Electrical,

ELECTRIC SUPPLY CO. manfrs and dealers in Electric Burglar Alarms, Annunciators, Cell Bells and Batteries. Telephone lines built and repaired. 145 Seneca Street.

Fresco Artists.

KEMMER & KUSHMAN DECORATIVE CO., Fresco Artists, Fine Modern Wall Papers. 338 Euclid ave.

Foundries.

BOWLER & CO., Car Wheels, Patent Chilled Frogs, and all kinds of castings. 9 Winter.

CLEVELAND MALLEABLE IRON CO., manufacturers Malleable Iron Castins.

LAKE SHORE FOUNDRY, Water and Gas Pipe, Light and Heavy Castings. Alabama st.

TAYLOR & BOGGIS, successors to H. & H. F. Taylor, Iron Founders, 65 to 73 Central Way.

VIADUCT FOUNDRY COM'Y, Aenis, Carlin & Strangward manfrs of Machinery Castings Fine Light Castings a Specialty. Office & Works 11 13 15 and 17 Detroit Strert. near Center.

ECLIPSE IRON WORKS manufacture Castings of all kinds. Cor Center & Winslow Sts

FITZSIMONS WM. & SON, Rolling Mill and Machinery castings. Rolls a Specialty. No. 435 Broadway.

File and Saw Works.

PARKIN, W. H. & CO., Hand-cut Files and Rasps, dealers in Disston's saws, 11 So. Water

Grindstones.

OHIO GRINDSTONE CO. manufacturers of and dealers in Grindstones. 127 Superior st.

Hotels.

FOREST CITY HOUSE, cor. Public Square and Superior st., Terrill & Ingersoll, Props.

KENNARD HOUSE, D. McClasky, Prop.

NEW ENGLAND HOTEL, Water st., W. W. Wolcott, Prop. Refitted and refurnished.

STRIEBINGER HOUSE, between Ontario and Seneca sts. $2.00 per day. Hawley & Langton

CITY HOTEL, Seneca street. H. B. West, proprietor. $1.50 per day.

Hides, Pelts and Leather.

DENNISON BROS., dealers in Hides, Pelts, Furs and Tallow. 48 and 50 River street.

Hardwood Lumber.

MARTIN, J. T. dealer in Hardwood Lumber, Stone's Levee, near Central Way.

Lumber.

WOODS, PERRY & CO., manufacturers and dealers in Lumber, Lath, etc., 5 Carter st

FISHER, WILSON & CO., wholesale lumber dealers (pine & hard wood), rough and dressed lumber, timber, lath shingles, etc. 47 Central Way

KRAUSE, C. A., & SON, wholesale and retail dealers in lumber. Yards cor. Superior and Wason and 281 Merwin streets.

Cleveland Business Directory.

Flue Cleaner.

CLEVELAND FLUE CLEANER M'F'G. CO. manufacturer of Aitchison & Doolittle's Patent Steam Flue Cleaner, 36 South Water Street.

Hardware and Iron.

BINGHAM, WM. & CO., Hardware, Iron, Nails and Metals, 148 and 150 Water street.

CLEVELAND ROLLING MILL CO., manuf'rs. of Steel and Iron Wire and Steel Tire.

WORTHINGTON, GEO. & CO., Hardware and Dealers in Metals. Water street.

Lime Manufacturers.

RUSSELL LIME CO., manufacturers of White Lime; also dealers in Plaster, Cement, etc. 85 Elm street.

Machinery and Boilers.

CLEVELAND STEAM FURNACE CO., Engines and Boilers, cor. Detroit and Center sts.

KRITCH, K. E. Metal Pattern Maker. Small machinery repaired. Lawn Mower sharpening a specialty. 42 South Water Street.

UNION MACHINE WORKS. Wason Street bet. St Clair and Superior Sts., manfrs and agents of G. W. Clayton's Elevators for passengers and freight. General machinists & jobbers.

PANKHURST, T. J. & CO., Valley Machine Works, manufacturers of Machinists' Tools, &c. Fine lathes a specialty. 6 Champlain street.

Machinery Depot.

CLEVELAND MACHINERY DEPOT, (now National Machinery Depot.) The largest stock of New and Second-hand Engines, Boilers and Machinists' Tools. Shop and Warehouse corner Bond and Superior streets.

Mercantile Agency.

THE MERCANTILE AGENCY. R. G. Dun & Co. proprietors. 121 Superior street.

Oil Manufacturers.

AMERICAN LUBRICATING OIL CO., manufacturers of lubricating oils. 23 Euclid ave.

Paints and Oils.

MASTERS, J. N. jobber in Paints, Oils, Varnishes. Brushes, 34 Prospect st.

Pattern and Model Makers.

WHITTINGHAM, J. & C., Metal Pattern and Model makers 52 Canal Street.

STAIR BUILDER.

PFEIL, CHAS, Stair Builder: Hard Wood Mantles and Office Railing. Works, 49 & 51 Canal street, Cleveland, Ohio

JOHNSON & PURSER, Stair Builders and manuf'rs of Mantels. Odd Pieces of Furniture, &c. 30 West street. up stairs.

Steel Stamps and Stencils.

FLEHARTY, J. H. & CO., Rubber Stamps, Seals, Stencils. 197 Superior street.

Tanners.

GAENSSLEN BROS., Tanners, and dealers in leather, oil and shoe findings. 80 Water-st.

Trunks and Valices.

FABER, J. manuf. Trunk, Traveling Bags and Ladies' Fine Satchels. Sample Trunks and Cases a Specialty. 56 Public Square.

Vessel Agents.

WEBB, H. J. & CO., Ship Brokers and Vessel agents. 17 & 18 Board of Trade Building. 122 Water Street.

Wood Carving.

HERKOMMER, J., Carver and Ornamenter in Composition. 225 Erie street.

Business Directory.

Akron, O.

AKRON IRON CO., manufacture best Common, Refined and Charcoal Iron.

CASCADE HOUSE, cor. Mill and Summit sts., near Depot. J. Downie, Prop.

MCNEIL, J. C., Steam Boilers, Heavy Sheet Iron Work. Repairing promptly executed.

PERKINS, C. E., dealer in Agricultural Implements, machinery, and Manufacturers' Ag'nt

TAPLIN, RICE & CO., manuf'rs. of Stoves and Hollow Ware, dealers in Tinners' Stock, etc.

WEBSTER, CAMP & LANE MACHINE CO., Founders and Machinists, 12 Main street.

Alliance, O.

ARLINGTON HOUSE, cor. Main and Liberty Streets. Centrally located. Sample Room for Commercial Travellers. H. S. Adams, proprietor

ALLIANCE INDUSTRIAL WORKS, E. Fawcett & Son, Proprietors, manufacturers of portable and stationary steam engines and circular saw mills.

MCFARLAND, J. W. Engine and Machine Builder, and General Machine Jobbing

Canton, O.

DIEBOLD SAFE & LOCK CO., manuf'rs. Safes, Locks, Bank and Safe Deposit Works.

NOVELTY IRON WORKS, Mill work, Shafting, engines, Imperial job printing press, etc

NEW AMERICAN HOUSE. Canton. Fred. Hipp, Prop.

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Business Directory.

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Business Directory.

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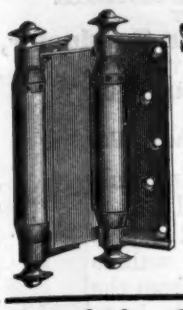

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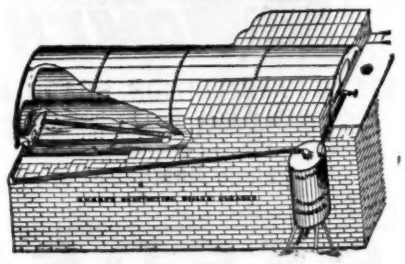

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With improvements recently made is unequaled as a neighborhood mill. It can be run by either steam or water power, and is especially adapted to the engines used for threshing.

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THIS IS OFFERED AS THE
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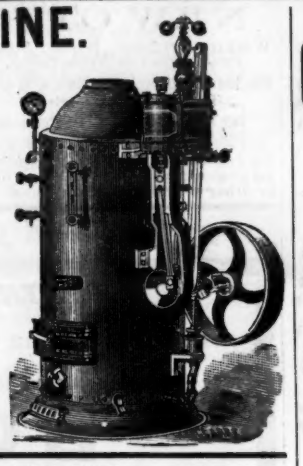

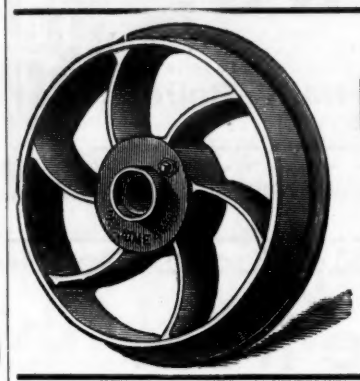

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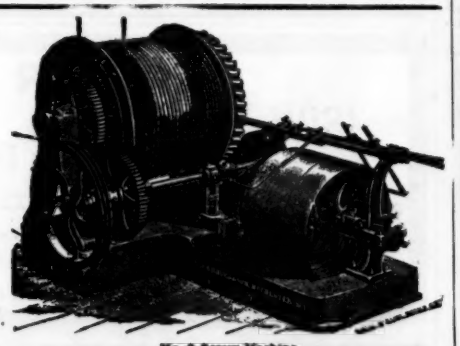
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Castings done in White Metal, Brass, Zinc, Type Metal, Pig Lead, Pig Tin, Bar Lead, Bar Tin, Antimony, Copper, Spelter, &c., &c.
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	Arrive.	Depart.
No. 20 Limited Express	1:35 A.M	*1.50 A.M
No. 6 Atlantic Express	*7:05	*7 30
No. 10 Buffalo Accom	11:00	11 15
No. 8 C. & St. L. Exp.	*2:25 P M	*2.55 P.M
No. 4 Special N. Y. Exp	10:10	10 35
No. 2 San. Div. Accom.	10:12	
No. 12 Conneaut Accom.		4 50
Nottigham Accommodation (Sundays only)	10.05 A.M 4 45 P M	9 00 A.M 2 15 P.M
No. 18 Elyria Accom.	8.50 A.M	

WEST BOUND TRAINS.

	Arrive.	Depart.
No. 13 Mich. Accom.		6.40 A M
No. 1 Special Chicago Ex.	*6 35 A.M	7.00
No. 3 Toledo Express	1.25 P.M	3.30 P.M
No. 21 St. Louis Express	*1.40	*2.05
No. 5 Pacific Express	*7.05	*7.35
No. 11 Conneaut Accom.	8.40 A.M	
No. 19 Pt. Clinton Accom.		5.00
No. 7 Michigan Exp.	*2.50 A M	*3.05 A.M
No. 17 N.Y. & Chi. Ex.	11.43 P.M	11.53 P.M

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No. 2 Col. & Cin. & Ind'polis Ex.	*7 10 A.M
No. 8 C. T.V. & W. & Clev Accom	10 30
No. 12 St. Louis & New York Exp.	3 00 P.M
No. 4 Special Cin & New York Exp	3 20
No. 10 Wheeling & Cleveland Exp.	8 25
No. 6 Indianapolis & Columbus Exp	10 20

DEPARTURES.

No. 1 Cincinnati & Columbus Exp.	8 00 A.M
No. 11 Cleve. Indianap. & Wheel'g Ex.	7 15
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No. 5 Night Express.	*7 25
No. 7 C T.V & W. & Col. Accom	4 00

Cleveland, Tuscarawas Valley & Wheeling.

ARRIVALS.

No. 4 Wheeling & Cleve'd Exp	8 25 P.M
No. 2 Uhrichsville Accom	10 30 A.M

DEPARTURES.

No. 1 Wheeling & Cleve'd Exp	7 15 A.M
No. 3 Uhrichsville Accom	4 00 P.M

New York, Pennsylvania & Ohio.

ARRIVALS.

No. 7 Mahoning Valley Accommo	10 55 A M
No. 8 New York Express,	*7 00 P M
No. 1 New York Express,	*6 50 A M
No. 3 Pittsburgh Express,	*7 00 P.M
No 5 Pittsburgh Express,	3 10
New York Express	3 10
No. 9 Youngstown and Pitts. Local	10 15

DEPARTURES.

No. 13 New York Express,	*7 10 A.M
No. 4 Youngstown Local,	11 15
No 8 Mahoning Accommodation,	4 25 P.M
No. 2 New York Express,	10 45
No. 12 Pittsburgh Express,	*7 10 A M
No. 6 Pittsburgh & Main Line Express	2 30 P.M

Cleveland & Pittsburgh.

DEPARTURES.		ARRIVE
Mail	8 50 A.M	1 15 P.M
Express	1 50 P.M	7 25
Alliance Accommodation	3 45	10 10 A.M
Ravenna Accommodation	5 30	8 35
Night Express	†11 40 P.M	6 30 A.M

† Night Express runs daily, except Saturday, by way of Wellsville, and on Saturday by way of Alliance.

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ARRIVE.		DEPARTURES.	
No. 2 Accom.	10 15 A.M	No. 1 Mail	*8 20 A.M
No. 6 Express	1 35 P.M	No. 3 Accom.	4 05 P.M
No. 4 Mail	6 30 P.M	No. 5 Exp.	6 30

Trains leave from Depot foot of South Water Street.

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Arrive.		Depart.	
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No. 3	7 15 P.M	No 2	8 50 A.M

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ESTABLISHED 1835.

Removed from 13 Water to Corner 23d and Smallman Streets, PITTSBURGH, PA.

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BOILERS,

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of all descriptions made to order on short notice. Have on hand a large stock

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A full line of Carriage and Plow Hardware kept in stock.

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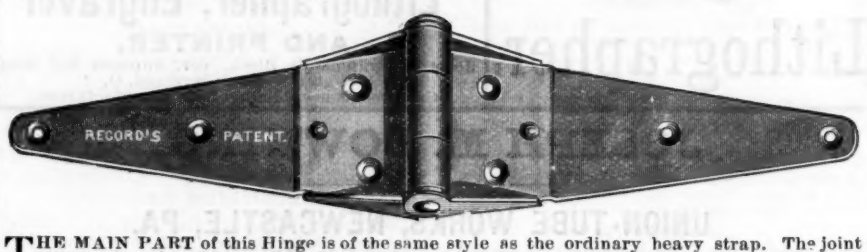

THE MAIN PART of this Hinge is of the same style as the ordinary heavy strap. The joint is strengthened by FLANGED SUPPORTS, made of extra quality of iron, spanning the entire width of each leaf, firmly riveted to the back of the hinge. The pintle of the hinge passes through the ear of the flange, thus adding greatly to its strength. Also, by the additional thickness of iron, greatly STIFFENING THE HINGE where most liable to bend, and secure against breaking where the greatest part of the STRAIN COMES. As the straps of the hinge are bent down, forming an offset for the reception of the supports, the hinge is smooth or flat on the back, same as the ordinary hinge. These hinges are neat in appearance, and owing to their great strength admitting of smaller sizes being used than heretofore, renders them the most economical, as well as the most desirable hinges made. They are applied the same as ordinary hinges.

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Also manufacturers of

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Orders solicited in Bulk, Barrels or Cases.

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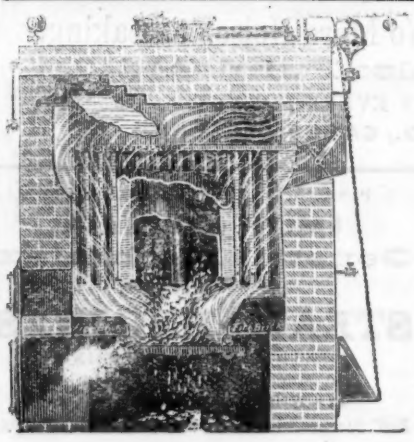

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MANUFACTURED BY THE

S. S. S. Conductor Co. LIMITED,

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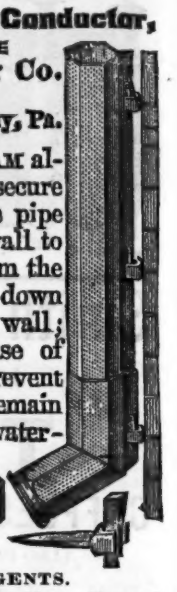

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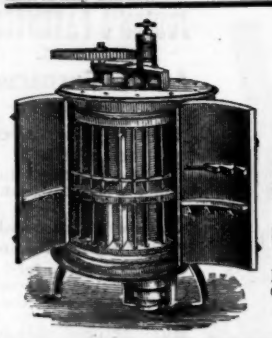

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Bran Dusters, Brushes and White Cloth furnished to order at Lowest Prices.

Young Men and Women

$85.00 PAYS TUITION, BOARD, &C.

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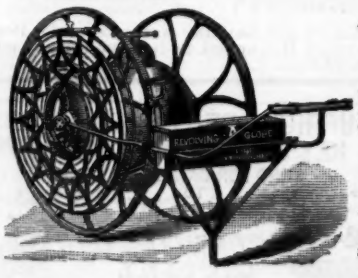

Stationary Globe and Stand-pipe for large buildings.

Cleveland to New York,

VIA THE

NEW YORK, PENNSYLVANIA AND OHIO RAILROAD.

[Formerly Atlantic & Great Western Railroad.]

For New York, Boston and the East. The shortest and quickest route to Pittsburgh, Washington, Baltimore and the Southeast

Until further notice trains will leave the new Central Depot, South Water Street and Viaduct, as follows:

7:10A.M. LIGHTNING EXPRESS, (daily,) sleeping and hotel coaches from Leavittsburg. 8:55 a.m. To New York, Albany and Boston without change. Parlor car, Cleveland to Salamanca. Arrives at Meadville 11:20 a.m., (dinner); Franklin, 12:33 p.m.; Oil City, 1:00 p.m.; Corry, 1:00 p.m.; Jamestown, (Lake Chatauqua) 1:57 p.m.; Buffalo, 6:15 p.m.; Rochester, 8:30 p.m.; Hornellsville, 6:40 p.m., (supper); Corning, 8:25 p.m.; Elmira, 8:57 p.m.; Binghampton, 10:58 p.m.; Albany, 6:00 a.m.; Boston, 2:45 p.m.; arriving at New York, 6:50 a.m.

10:45 P.M. NIGHT EXPRESS, (daily except Sunday), sleeping Coach from Leavittsburg to New York without change. Arrives at Youngstown 1:45 a.m.; Meadville, 3:50 a.m.; Corry, 5:20 a.m.; Jamestown, 6:22 a.m.; Buffalo, 9:45 a.m.; Rochester, 1:10 p.m.; Hornellsville, 11:20 a.m.; Corning, 12:53 p.m.; Elmira, 1:21 p.m.; Binghampton, 2:50 p.m.; New York, 9:25 p.m.

2:30 P.M. PITTSBURGH EXPRESS,—daily, through without change. Parlor Car, Cleveland to Pittsburgh, arrives at Youngstown, 5:00 p.m.; Pittsburgh, 8:25 p.m.; Washington, 7:30 a.m.; Baltimore, 8:15 a.m.; via Sharon and Sharpsville to Meadville 7:40 p.m.

4:25 P.M. MAHONING ACCOMMODATION, stopping at all way stations. Arrives at Youngstown, 7:30 p.m; Sharon, 8:30 p.m; Sharpsville 8:40 p.m; connects at Leavittsburg with train No. 20 for Meadville and intermediate points, arrives at Meadville, 11:05 p.m.

7:10 A.M. PITTSBURGH EXPRESS,—(daily) through without change. Arrives at Youngstown, 10:00 a.m.; Sharon, 10:55 a.m.; Sharpsville, 11:05 a.m.; Pittsburgh, 1:08 p.m. Returning, leave Pittsburgh, 4:48 a.m., 8:55 a.m., and 1:13 p.m. and 4:20 p.m.

11:15 A.M. YOUNGSTOWN & PITTSBURGH Accommodation, stopping at all Way Stations, arriving at Youngstown 2:10 p.m.; Pittsburgh, 6:10 p.m. Trains arrive at Cleveland, 6:50 a.m., 10:55 a.m. 3:10, p.m. 7:00 p.m., and 10:15 p.m.

☞ This is the only route by which passengers can reach Corry, Elmira, Binghampton, New York City, and intermediate points WITHOUT CHANGE. No change to Boston and New England cities.

Baggage Checked Through to All Points East

☞ Through Tickets and information regarding the route can be obtained at the Union Ticket Office, corner Bank and Superior streets; at office 131 Bank street, and at new Depot of New York, Pennsylvania and Ohio Railway, South Water street and Viaduct, Cleveland.

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Gen. Pass'r. Agt., Cleveland, Ohio.
M. L. FOUTS,
P. D. COOPER, Pass. Agt., 131 Bank st.,
Gen. Man'gr, Cleveland. Cleveland.

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POPULAR THOROUGHFARE

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EAST AND WEST.

No Midnight Changes!
No Emigrant Trains!
Connections in Union Depots for all Points.

☞ The unequalled facilities offered by this Company for luxurious travel are

Elegant, easy riding, Day Coaches,
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Elegant Horton Reclining Chair Cars, between Lake Erie (Cleveland,) **and the Mississippi River,** (St. Louis) **FREE.**

Model Hotel cars attached to Express Trains, which together with a track and road bed of known excellence, you are assured Comfort and Safety with

FAST TIME!

☞ Bear in mind that our through car routes are numerous and excellent, a great convenience to all travelers.

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Contains the Latest News from Mines, having correspondents in all the principal mining camps. Latest mining stock quotations from San Francisco, Boston, Philadelphia and New York markets; also special reports and prices of the IRON. and COAL market.
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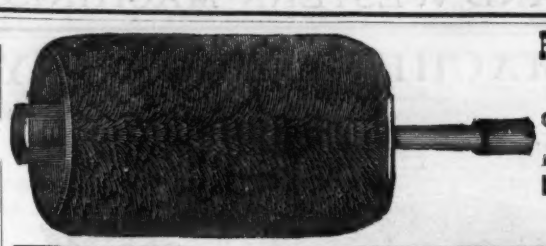
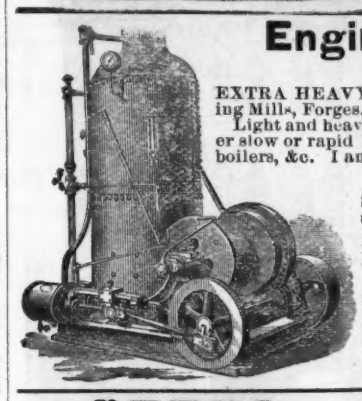
MFRS. OF HAND & POWER BOLT & PIPE CUTTERS, BOLT POINTERS, BOLT HEADERS, HOT & COLD PRESSED NUT MACHINERY, TAPS & DIES, &c. SEND FOR CIR. CLEVELAND, O.



Patent Steel Tube and Flue Brush.
Best in the Market.
Made any size required.
Combines the properties of a Scraper and Brush.
Full stock always on hand.
L. B. Flanders Machine Works
1025 Hamilton street,
PHILADELPHIA, PA.



Engines, Hoisting Machines
And General Machinery.

EXTRA HEAVY STEAM ENGINES and other machinery adapted for Rolling Mills, Forges, Mines, &c., specially designed to suit local requirements.

Light and heavy Hoisting machinery of every description, adapted for either slow or rapid hoisting, and with or without Friction Clutches or Steam boilers, &c. I am now prepared to manufacture my recently designed

FRICTION BAND HOIST,

Specially designed for rapid hoisting, which for cheapness, simplicity, driving capacity, ease and reliability of operation will be found superior to any other hoisting machine in the market. Patterns changed or new patterns made in any case to suit local requirements,

To parties wishing to build newly designed machinery I give especial attention.

Designs and estimates for machinery, as a base for negotiations, forwarded on application. Promptitude guaranteed. Correspondence solicited.

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STEEL CASTINGS

FROM 1-4 TO 15,000 LBS. WEIGHT. TRUE TO PATTERN, sound and solid, superior in strength, toughness and durability to iron forgings in any position, or for any service whatever. Gearing of all kinds, Shoes, Dies, Hammerheads, Crossheads, Rockers and Piston Heads for Locomotives, etc. 15,000 Crank Shafts and 10,000 Gear Wheels of this Steel now running prove its superiority over other Steel Castings. CRANK SHAFTS, CROSSHEADS & GEARING SPECIALTIES. Circulars and Price Lists free.

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CHESTER STEEL CASTINGS CO.,
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IMPROVED

Hoisting Engines,

Manufactured by the
LIDGERWOOD M'F'G CO.
Offices and Sales Rooms 96 Liberty St., New York
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Specially adapted for Railroads and Contractors uses, Pile Driving, Bridge & Dock Building, Excavating, etc Single or double Cylinders, with single or double Improved Friction Drums, with or without Boilers.

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Black Birch Carriage, Wagon and
TRUCK HUBS.
Sizes from 3½x6½ to 18x22.
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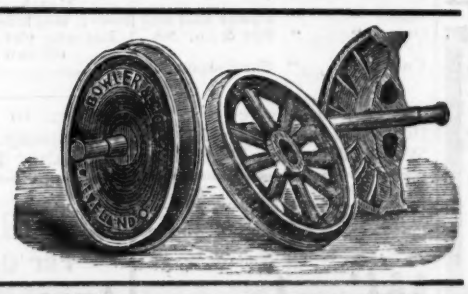
Cleveland Foundry.
CASTINGS
For Machinery and Rolling Mills.
Car Wheels
all sizes and kinds, with and without Axles.
Chilled Faced R. R. Frogs.
STREET RAILROAD TURNOUTS
Nos. 9, 11, and 13 Winter Street.
BOWLER & CO.



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The strongest, safest and most economical explosive KNOWN TO THE ARTS.

No. 1—XX for hard rock, iron and copper ores, boulders, masses of iron, etc.
No. 2—For medium hard rock, lime quarries, sand stone, stumps, etc.

J. W. WILLARD, Agent,
Office—181 Superior Street, Cleveland, Ohio.

C. L. JEFFORDS,
Manufacturer of
Axes and Edge Tools.
JAMESTOWN, N. Y.
Send for prices to the Trade.

CLEVELAND & PITTSBURGH
RAILROAD.

Trains leave and arrive daily, (Sunday excepted,) at the points named below, as follows:

MAIN LINE—GOING WEST.

	Western Expr'ss.	Mail Expr'ss.	Fast Line	Accom.
Leave				
Pittsburgh	7 30 a.m.	2 00 pm	11 50 pm	.....
Allegheny	7 40	2 10	12 00 am	.....
Arrive				
Rochester	8 23	3 00	12 50	.....
Beaver	8 30	3 05	12 55	.....
E. Liverpool	9 08	3 37	1 37	.....
Wellsville	9 18	3 47	1 50	.....
Salineville	9 57	4 34	2 33	.....
Bayard	10 34	5 02	3 21	.....
Alliance	11 05	5 25	3 55 am	.....
Leave				
Alliance	11 10	5 25	4 05	7 30 am
Arrive				
Ravenna	11 48	5 59	4 47	8 15
Hudson	12 18 p.m.	6 28	5 15	8 50
Cleveland	1 15 p.m.	7 25 pm	6 30 am	10 10 am

Accommodation train leaves Ravenna at 6.45 a.m., arrives Hudson 7.15 a.m., Cleveland 8.35 a.m.

☞ Mail Express runs through Parlor Car, Fast Line and Western Express through Sleeping Car. Pittsburgh to Cleveland.

NOTE.—Fast Line leaves Pittsburgh Sunday nights, but not on Saturday nights.

MAIN LINE—GOING EAST.

	Pittsb'g Expr'ss.	Fast Line.	Day Expr'ss.	Accom.
Leave				
Cleveland	8 00 am	1 50 pm	11 40 pm	3 45 pm
Arrive				
Hudson	9 05	2 50	12 50 am	4 55
Ravenna	9 37	3 17	1 18	5 30
Alliance	10 20	3 53	2 05	6 20 pm
Bayard	10 54	4 16	2 49	.....
Salineville	11 40	4 51	3 40	.....
Wellsville	12 20 pm	5 20	4 35	.....
E. Liverpool	12 54	5 44	4 57	.....
Beaver	1 30	6 17	5 47	.....
Rochester	1 35	6 22	5 52	.....
Allegheny	2 30	7 05	6 45 am	.....
Pittsburgh	2 40	7 15	6 55	.....
Harrisburg	.....	3 50 am	4 00 pm	.....
Baltimore	.....	7 30	7 20	.....
Washington	.....	9 03	8 47	.....
Philadelphia	.....	7 20	7 35	.....
New York	.....	10 25	10 35	.....
Boston	.....	8 00 pm	.....	.....

Accommodation train leaves Cleveland Union Depot at 5.30 p.m., arrives Hudson 6.50 p.m., Ravenna 7 20 p.m.

All trains connect at Yellow Creek for Wheeling and Bellaire.

☞ Pittsburgh Express runs a Parlor Car Cleveland to Pittsburgh. Fast line runs Through Sleeper to New York. Day Express runs Through Sleeper to Pittsburgh.

TUSCARAWAS BRANCH.

Trains leave Bayard at 11.00 a.m. and 5.10 p.m. arrive Minerva 11 08 p.m and 5 20 p.m: arrive Dover 12 18 p.m. and 7.15 p.m., New Philadelphia 12.30 p.m. and 7.30 p.m. Returning leave New Philadelphia at 7.00 a.m. and 2.05 p.m., Dover at 7.30 a.m. and 2 15 p.m., Minerva at 9 45 a.m. and 3.28 p.m., Bayard at 10.00 a.m and 3.33 p.m.

All trains daily except Sunday.

D. W. CALDWELL, General Manager. E. A. FORD, Gen'l Pass. & Tkt. Agt.
Pittsburgh, Pa.

E. E. GARVIN & CO.

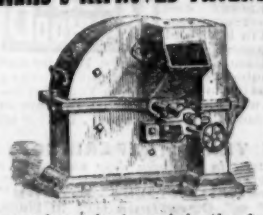
Manufacturers of

Milling Machines, Drill Presses
Hand Lathes, Tapping Machines, Cutter Grinders and Wood Planers. Milling Cutters, all shapes and sizes. Gear Cutting and Milling in all its branches. No. 4 Milling Machine.

139-143 Center Street,
Cornell's Building, NEW YORK.
☞ Send for Illustrated Catalogue.

SAFETY STEAM, WATER & HAND POWER
GIVE HATCH SIZE, & ELEVATION OF BUILDING, & SEND FOR ILLUSTRATED CIRCULAR
ELEVATORS.
C. H. MITCHELL & CO.
105 MICHIGAN ST. CHICAGO

MEAD'S IMPROVED PATENT DISINTEGRATER.



For disintegrating, granulating or grinding without friction all kinds of material. It requires less power and grinds faster than any machine in the market. Is strong and simple; not liable to get out of order; no annoyance to workman from dust, and is the best machine in the market for grinding sugar, glue, sumac or drugs. Descriptive pamphlets will be sent free on application to MEAD & CO., 32 Atwater street, DETROIT, MICH.

Please say where you saw this advertisement.

Toledo Saw and File Works.
E. G. PECKHAM,
Manufacturer of all kinds of
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Repairing promptly attended to. Thin Planer Knives a specialty. Also manufacturer and jobber of FILES. Old Files Re-Cut. 6 St Clair street, TOLEDO, O.

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Also Manufacturer of the "Star Cuspador."

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Gentlemen's Clothes Cleaned, Dyed and Repaired a Specialty.
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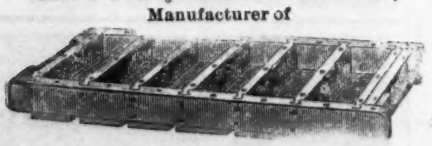
Elevator Bucket & Chain Belting
For elevating, conveying and driving purposes.
From 61 to 68 Columbia Street,
BUFFALO, N. Y.

D. J. C. ARNOLD,
Manufacturer of

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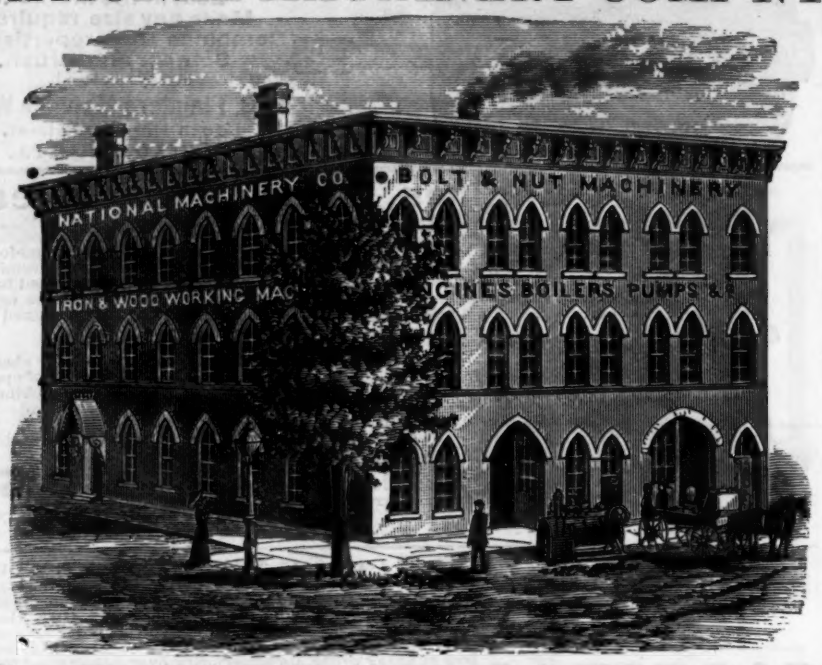
All goods first class. Orders and correspondence solicited. NEW LONDON, O.

Seminal Weakness, Pimples and Impure Blood, loss of Energy and Strength, aversion to Society, Pains in Back and Loins, Impaired Memory, Palpitation, loss of Vitality, Bladder and Urinary troubles, distressing Night Emissions and the vital drain arising from Youthful Indiscretion, which, if neglected, terminate in Impotence and Premature Decay, treated on results of
LOST MANHOOD
THIRTY YEARS' EXPERIENCE,
effecting cures *in as many days* as requires weeks under ordinary nauseating remedies. ***"Treatise on Nervous Debility" and List of Questions*** sent in plain, sealed envelope on receipt of two 3c. stamps. Medicine sent everywhere, but visit preferred where practicable. No hindrance to business: separate rooms: strictly confidential: hours, 9 A.M. to 9 P.M.
DR. CLEGG, 125 ST. CLAIR ST. Cleveland, O.

NATIONAL MACHINERY COMP'NY.


Cor. Bond & Rockwell Streets, Cleveland, O.
SALESROOM—384 SUPERIOR STREET, CORNER BOND.
Manufacturers of
"National" Bolt and Nut Machinery,
Agents and Stock kept of Pratt & Whitney's Screw Cutting Tools, Taps, Dies, &c. Agents for J. A. White's, Levi Houston's and J. S. Graham & Co.'s Wood Working Machinery.
STOCK KEPT OF IRON AND WOOD WORKING MACHINERY,
Boilers & Engines.

In Stock for Sale:
One Thern and DeHaven Drill.
One No. 7 Long & Allstatter's Double Punch and Shears,
One 4-horse power Engine and Boiler.
One 6-horse power Engine and Boiler
One 7-horse power Engine and Boiler.
One 10-horse power Engine and Boiler.
One 5-horse power Engine.
One 8-horse power Engine.
One 12-horse power Engine.
One 25-horse power Engine. New.
One 30-horse power Engine. New.
One portable Engine and Boiler 7½x10, mounted on wheels. All in complete order. Used only about three years.
One 30-inch under run French burr mill. All complete. Send for description and price.
One 35-horse power Engine. And several others all in stock.
New and Second Hand Belting, Pulleys, 2 Water Motors, &c., &c.

List of Wood Tools.
One second-hand Frank two-spindle Shaper, $65.
One " " wood frame 2-spindle Shaper, $35
One " " " " Cutting-off Saw, $30
One " " " " Spoke and Handle Lathe $125
One " " 22 inch Greenwood Heading Planer, $125
One " " Ellis Blind Slat Tenoner.
One " " 24-inch Ball & Co., Planer and Matcher.
One " " Power Rod and Dowell machine
One " " Fay & Co. No. 1 Railway Cut-off Saw.
Two " " Sandpaper Drums.
One second-hand Dimension Planer, 24-inches, with Feed attachment.
One " " wood frame swing Cut-off Saw and Table.
One " " Slotting machine.
One " " Thorn & Dehaven Drill.
Two " " Saw Tables.
One wood frame 6 inch Sticker.
Large lot second-hand Trenton Vises.
Large lot second-hand Anvils.
One Fay & Co. Agricultural Morticer, with boring attachment.
One Fay & Co. iron frame Tenoning machine, double heads.

Having moved our Salesroom to the large room previously occupied by the Wilson Sewing Machine Company, we are able to carry a very fine line of Wood Working Machinery and other Tools.

Glazed Windows.
CLEVELAND WINDOW GLASS CO.
For Doors, Sash, Blinds and Windows,
American, French & Plate Glass
73 Michigan Street and 132 Champlain Street,
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NIAGARA STAMPING AND TOOL CO.,
Manufacturers of
Power and Foot Presses,

Dies and Tools
FOR WORKING
Sheet Metal and Wire.

FRUIT CAN
And Tinners' Tools, &c.
Nos. 147 and 149 Elm Street,
BUFFALO, N. Y.

Cleveland, Akron and Columbus RAILROAD.

Trains leave and arrive daily (Sundays excepted) at the points named below.

GOING SOUTH.

STATIONS. February 20, '82.	Miles	Mail and Expr 2	Thro' Pass'gr 4	Accom 6	Accom 8
		A.M.	P.M.	P.M.	
Cleveland		8.00	1.50	3.45	.....
Hudson (1)	0	9.15	3.00	5.05	.....
Cuyahoga Falls	8	9.32	3.18	5.23	.....
Akron (2)	14	9.47	3.33	5.36 5.50	.....
Clinton	27	10.17	4 04	6.23	.....
Warwick	28	10 23	4.10	6 31	.....
Marshallville	33	0 35	4.23	6.45	.....
Orrville (4)	39	10.51	4.43	7.03	.....
Fredricksburg	52	11.22	5.16	7.37	.....
Holmesville	56	11.34	5 28	7.52	A M.
Millersburg	62	11 48	5.41	8.05	5.40
		P.M.			
Killbuck	68	12.02	5 55	.....	5.54
Black Creek	74	12.16	6.09	.....	6.08
Gann	82	12.41	6.35	.....	6.33 6 53
Danville	86	12 55	6.49	.....	7.07
Howard	91	1.05	6.59	.....	7.18
Gambier	95	1.15	7.11	.....	7.29
Mt. Vernon (5)	100	1.30	7.27	.....	7.43
Mt. Liberty	109	1.58	7.47	.....	7 59
Centerburg (6)	114	2.08	7.57	.....	8.10
Condit	120	2 22	8 11	.....	8.24
Sunbury	124	2.31	8 20	.....	8.35
Galena	126	2.36	8.26	.....	8.41
Westerville	133	2.51	8 42	.....	8.58
Columbus (7)	145	3.15	9.06	.....	9.23

GOING NORTH.

STATIONS. February 20, '82.		Thro' Pass'gr 1	Mail Expr 3	Accom 5	Accom 7
		A M.	P M		P.M.
Columbus	0	6.00	12.15	.....	5.05
Westerville	12	6.25	12 41	.....	5.32
Galena	19	6.41	12.57	.....	5.49
Sunbury	21	6.47	1.03	.....	5.55
Condit	25	6.56	1.13	.....	6.06
Centerburg	31	7.10	1.27	.....	6.20
Mt. Liberty	36	7.20	1 38	.....	6.33
Mt. Vernon	45	7.43	2.02	.....	6.50
Gambier	50	7.55	2.15	.....	7.11
Howard	54	8.05	2.25	.....	7.23
Danville	59	8.15	2.36	.....	7.34
Gann	63	8.30	2.50	.....	7.49
Black Creek	71	8.56	3.15	.....	8.15
Killbuck	77	9.10	3.28	.....	8.29
				A. M.	
Millersburg	83	9.26	3.43	5.50	8.43
Holmesville	89	9.37	3.55	6.05	.....
Fredricksburg	93	9.49	4.06	6.18	.....
Orrville	106	10.23	4.43	6.50 7.10	.....
Marshallville	112	10.35	4 55	7.23	.....
Warwick	117	10.46	5 09	7.37	.....
Clinton	118	10.52	5.15	7.46	.....
Akron	131	11.28	5.47	8.22	.....
Cuyahoga Falls	137	11.41	6.00	8.35	.....
Hudson	145	12.00 M	6.18	8.55	.....
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